Step 3 deals with the current range, distribution and condition of the relevant ecosystem elements within the watershed. It documents the more detailed analyses completed for the core topics and other ecosystem elements identified in the characterization of the watershed and issues and key questions. Current condition refers to the time period from about 1945 to present.

Erosion Processes

Erosion means the wearing away of the land surface by detachment and movement of soil and rock fragments through the action of moving water or wind and by gravity. Once this material moves from its position in the landscape it is considered to have eroded. Much of this material is deposited along the way where it becomes part of the soil mantle.

The current erosional condition of the watershed reflects management influences which began in the late 1800s with the introduction of logging, road building and grazing from large herds of sheep. By 1950, a national market had developed for lumber and logging increased significantly. All of these activities have resulted in cumulative effects to the soil over time with a resultant increase in accelerated erosion rates. These activities often change the amount of organic matter covering the soil, the physical properties of the soil, the infiltration and percolation of water, and consequently the amount of water that flows over the land surface. The effects of wildfires on soil erosion have diminished over time and are assumed to have returned to natural levels. Most erosion effects due to grazing occur within riparian zones with minimal levels occurring on the uplands.

Road building and logging have generally had the greatest effect on increasing upland erosion rates over natural levels. A model for management-induced surface erosion was developed for timber harvest and road activities using the Guide for Predicting Sediment Yields From Forested Watersheds (1981). Erosion rates should be considered as indicative of relationships with the various activities rather than as absolutes because of the many interrelated variables that influence the erosion process. No soil loss rate monitoring data is available.

This model is based on research data that suggests a basic soil loss rate associated with roads, fire and logging, which are reduced as a function of time since the activity took place. The erosion rates in the model are modified by the dominant controlling variables on the land unit on which they occur, the magnitude of the activity, specific characteristics of the activity, and possible mitigation factors. Geologic erosion factors are used as coefficients to modify basic erosion rates. Basalt igneous rock types have a geologic erosion factor of 0.42 and acid igneous (granitic/rhyolitic) have a geologic erosion factor of 1.0. Therefore, the assumption is that basalt derived material is 42% as erosive as rhyolite material. Most of the soils in the watershed are basalt derived with small portions of the headwaters of Big Lake, Peddlers Creek, Drake Creek, Mud Creek, Upper Deep Creek and Dismal Creek subsheds having rhyolite as parent material. The geologic factors in the following models are based on weighted averages of the different geologic parent materials.

Table 3 shows estimated current erosion rates for roads.

Table 3. Estimated Erosion Relating to Roads (tons/yr)*

Subshed	Total Road Mi	Total Road Ac	Basic Erosion Rate	Geologic Er Factor	Mitigation % Reduction	Erosion Rate (tons)
Mud Cr. (01)	112	244	5,000 t/sqmi	.68	45%	713
Lwr. Camas (02)	97	211	5,000 t/sqmi	.83	45%	753
Horse Cr. (03)	48	104	5,000 t/sqmi	.44	45%	197
Burnt Cr. (04)	58	126	5,000 t/sqmi	.60	45%	325
Crane Lake (05)	41	89	5,000 t/sqmi	.59	45%	226
Upper Deep (06)	23	50	5,000 t/sqmi	.65	45%	140
Dismal Cr. (07)	29	63	5,000 t/sqmi	.46	45%	125
Willow Cr. (08)	70	152	5,000 t/sqmi	.55	45%	359
Cressler Cr. (09)	23	50	5,000 t/sqmi	.68	45%	146
Big Valley (10)	4	9	5,000 t/sqmi	.86	45%	33
Lower Deep (11)	12	26	5,000 t/sqmi	.56	45%	63
Blue Cr. (12)	24	52	5,000 t/sqmi	.57	45%	127
Peddlers Cr. (13)	20	44	5,000 t/sqmi	.50	45%	95
Drake Creek (14)	75	163	5,000 t/sqmi	.54	45%	378
Gibson Canyon (15)	28	61	5,000 t/sqmi	.48	45%	126
Upper Twelvemile (101)	1	2	5,000 t/sqmi	.42	45%	4
Fifteenmile (103)	11	24	5,000 t/sqmi	.42	45%	43
Twentymile (104)	~		5,000 t/sqmi	.42	45%	~

Estimated Total: 3,853 t/yr

* The road area includes the distance from the toe of the fill slope to the top of the cutslope. This distance is estimated to be 18 feet on average. It includes all system roads and assumes roads are cross drained. The geologic erosion factor adjusts the basic erosion rate to reflect inherent soil loss rates for different geologic rock types. The basic erosion rate represents a stable value from 3 to 6+ years after initial construction. The mitigation % reduction further reduces erosion rates according to various mitigation measures.

Table 4 shows estimated current erosion rates for timber harvest.

Table 4. Estimated Erosion Relating to Timber Harvest (tons/yr)*

Subshed	Percent Impacted	Acres Impacted	Basic Erosion Rate	Geologic Er Factor	Erosion Rate (tons)
Mud Creek (01)	44	6,146	90 t/sqmi/yr	.68	588
Lower Camas Cr. (02)	5	1,115	90 t/sqmi/yr	.83	130
Horse Cr. (03)	10	1,925	90 t/sqmi/yr	.44	119
Burnt Creek (04)	39	3,304	90 t/sqmi/yr	.60	279
Crane Lake (05)	14	1,598	90 t/sqmi/yr	.59	133
Upper Deep Creek (06)	7	571	90 t/sqmi/yr	.65	52
Dismal Creek (07)	5	388	90 t/sqmi/yr	.46	25
Willow Creek (08)	34	3,019	90 t/sqmi/yr	.55	234
Cressler Creek (09)	10	544	90 t/sqmi/yr	.68	52
Big Valley (10)	0	0	90 t/sqmi/yr	.86	0

Subshed	Percent Impacted	Acres Impacted	Basic Erosion Rate	Geologic Er Factor	Erosion Rate (tons)
Lower Deep Creek (11)	2	156	90 t/sqmi/yr	.56	12
Blue Creek (12)	18	1,807	90 t/sqmi/yr	.57	145
Peddlers Creek (13)	7	510	90 t/sqmi/yr	.50	36
Drake Creek (14)	3	1,112	90 t/sqmi/yr	.54	84
Gibson Canyon (15)	0	0	90 t/sqmi/yr	.48	0
Upper Twelvemile (101)	0	0	90 t/sqmi/yr	.42	0
Fifteenmile (103)	10	276	90 t/sqmi/yr	.42	16
Twentymile (104)	~	~	90 t/sqmi/yr	.42	~

Estimated Total: 1,905 t/yr

* The logging system used for this evaluation was clearcutting with tractor yarding. Temporary roads, skid trails and landings are assumed to have been water-barred and seeded. Calculations assume high current disturbance areas have erosion rates equal to four years after the initial disturbance. This value is conservative and actual erosion rates are most likely lower.

The effects of current management activities on soil productivity was evaluated to determine the extent of all lands in an adverse condition. Adverse conditions are detrimental effects on the soil resource (Land and Resource Management Plan for the Fremont National Forest, page 80). The analysis evaluated all system roads, landings, spur roads and skid trails as well as lands detrimentally compacted, puddled, displaced or eroded. All subsheds within the watershed were mapped as follows: none - no adverse impacts; light - adverse soil impacts occur on less than 10% of the area; moderate - adverse soil impacts occur on 10 - 20% of the area; and high - adverse soil impacts occur on more than 20% of the area.

Table 5 shows the estimated percent of each watershed in the none/slight/moderate/high category.

Table 5. Estimated Current Disturbances of Subsheds (%)

Subshed	High	Moderate	Light or Not Related
Mud Creek (01)	44	19	37
Lower Camas Cr. (02)	5	28	67
Horse Cr. (03)	10	21	69
Burnt Creek (04)	39	21	40
Crane Lake (05)	14	2	84
Upper Deep Creek (06)	7	4	89
Dismal Creek (07)	5	1	94
Willow Creek (08)	34	24	42
Cressler Creek (09)	10	3	87
Big Valley (10)	0	0	100
Lower Deep Creek (11)	2	0	98
Blue Creek (12)	18	0	82
Peddlers Creek (13)	7	0	93
Drake Creek (14)	3	0	97

Subshed	High	Moderate	Light or Not Related
Gibson Canyon (15)	0	0	100
Upper Twelvemile (101)	0	0	100
Fifteenmile (103)	10	0	90
Twentymile (104)	~	~	~

~ - Not available

More specifically, Willow Hawk timber sale harvest unit #2 was intensively monitored to determine overall soil impacts. Total adverse impacts were 40%. This is consistent with other timber sale harvest units monitored on the Fremont National Forest (Thomas Creek W. A., Dairy/Elder and South Creek W. A. and Silver Creek W. A.). Generally, adverse impacts increase on flat slopes where tractor logging has occurred. Conversely, they decrease on steeper slopes where less tractor logging has occurred. Monitoring has shown that soil compaction is the largest adverse impact, with displacement and puddling being only a small part of total impacts.

Current conditions of mass movement are not a high concern within most of the subsheds. However, 281 acres of landslide deposits are identified on the GIS geology coverage in the Upper Deep Creek subshed. Evidence of historic landslides indicates that this area is susceptible to further mass failure. The potential also exists for debris avalanches to occur on steeper slopes on rhyolitic eruptive centers. Portions of the headwater area of Big Lake, Peddlers Creek, Drake Creek, Mud Creek, Upper Deep Creek and Dismal Creek subsheds have parent material consisting of rhyolite flows which are at risk of debris avalanches on steeper slope areas. Road building and logging significantly increase the risk for either type of mass movement within both the historic landslide area and the rhyolite flow areas.

Once eroded soil or rock particles reach a stream channel, it is considered sediment. Although sediment is dependent on the degree of erosion, these parameters are not the same. It is estimated that at least 10 to 20% of the total erosion becomes sediment in current conditions. The amount of sediment generated by project activities is largely dependent on the position of a project in the watershed. Projects located in the upper portions of the watershed generally produce less sediment than projects in the lower areas. Also, most sediment can be mitigated by providing adequately spaced drainage structures and buffers between the project site and the stream course. Field observations by Mike Montgomery show that many cross drainage structures (waterbars and dips) do not meet spacing recommended in the Guide to Erosion Control on Forest Roads and Trails (1973) and that many roads are located within Riparian Habitat Conservation Areas (RHCAs). Lack of cross drainage and riparian buffers is resulting in sediment in the stream channel.

Hydrology

Continuous flows have been recorded at three U.S. Geological Survey (USGS)/State operated gauging stations: 1) Deep Creek above Adel (1931-1991), 2) Drake Creek (1948-1973) and 3) Twentymile Creek near Adel (1941-1991). Also, spot flows were recorded for streams during the Level II stream inventory. Current conditions of base flow, mean flow, peak flow and hydrologic conditions associated with roads, compacted soil and canopy removal are discussed below. Flows are available for Camas Creek, but were not used in this analysis.

A. Base Flow

Base flows occur during late summer and early autumn (August, September, October and November). These are the minimum streamflows that naturally occur from a combination of factors including low precipitation, reduced drainage from the soil and bedrock and sustained high evapotranspiration. Base flows are important for maintaining aquatic and riparian habitat, water for irrigation and for maintaining wildlife and livestock watering sources.

High elevation streams are very stable and have water tables near the surface. Base flows in the upper watershed are not affected by downcutting. Lower elevation streams in alluvial depositional areas have lower water tables in current conditions than in reference conditions. This has occurred through channel downcutting and loss of beaver habitat. Base flows are most likely lower below these riparian areas. The magnitude of this change is unknown.

Meadow areas have been dried by channel downcutting and channel construction by man. Many streams in the lower elevations have wide alluvial depositional areas (meadows) that are downcut and have lost their wide riparian component. Big Valley was most likely a large wet meadow area in reference conditions. The historic conditions are unknown, but it is assumed that the area had a very high water table with large expanses of willow and beaver populations. Presently, the area has been channelized and uses water from Deep Creek for irrigation. Further information about current conditions of Big Valley is unknown. Water rights information can be obtained from the Watermaster, District 12, Oregon Water Resources Department. In summary, channelization by man and stream channel downcutting has resulted in a lowering of the water table that provides less flow in late season below the historic wet meadow areas. The magnitude of this change is unknown.

The volume of base flow varies depending upon location in the watershed. The gauging sites higher in the watershed show substantially larger flows per square mile than gauging sites at lower elevations. Table 6 shows the base flow per square mile for gauged/recorded streams.

Table 6. Base Flows For Select Streams

Major Stream/Tributary	Base Flow (CFS)	Base Flow/ Mi^2	CFS/Mi^2	Date
USGS Gauging Stations				
Deep Creek above Adel	4.3	249	.01	9/4/81
Twentymile Creek near Adel	2.3	194	.01	9/4/81
Drake Creek (mouth)	5.8	67	.09	9/4/81
Camas Creek		Data Gap		
Spot Flow Records				
Deep Creek (near FS boundary)	1.9	13.5	.14	9/4/81
Dismal Creek (mouth)	1.3	10.0	.13	9/4/81
Willow Creek (near FS boundary)	1	8.5	.12	9/1/82

B. Mean Flow

Average daily flows are available at the three gauging sites identified above. The mean of these are shown in Table 7 for each month for the last 15 years.

Table 7. Mean Daily Flow
Last 15 Years of Record

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Deep Creek	25	44	78	66	112	200	333	420	200	37	14	18
Twentymile Cr.	5	11	25	36	127	164	102	96	46	10	4	4
Drake Creek	7	7	7	24	29	40	23	17	10	7	7	7

Note: Calculations in the following sections use data for years of average precipitation. This was determined using plus or minus one standard deviation of the mean precipitation as measured in Lakeview, Oregon (9.9-18.3 inches).

Further evaluation of the mean flows show that the volume of water produced per inch of precipitation varies greatly from one watershed to another. The results of this analysis are shown in Table 8 for average precipitation years (9.9 to 18.3 inches) measured in Lakeview, Oregon.

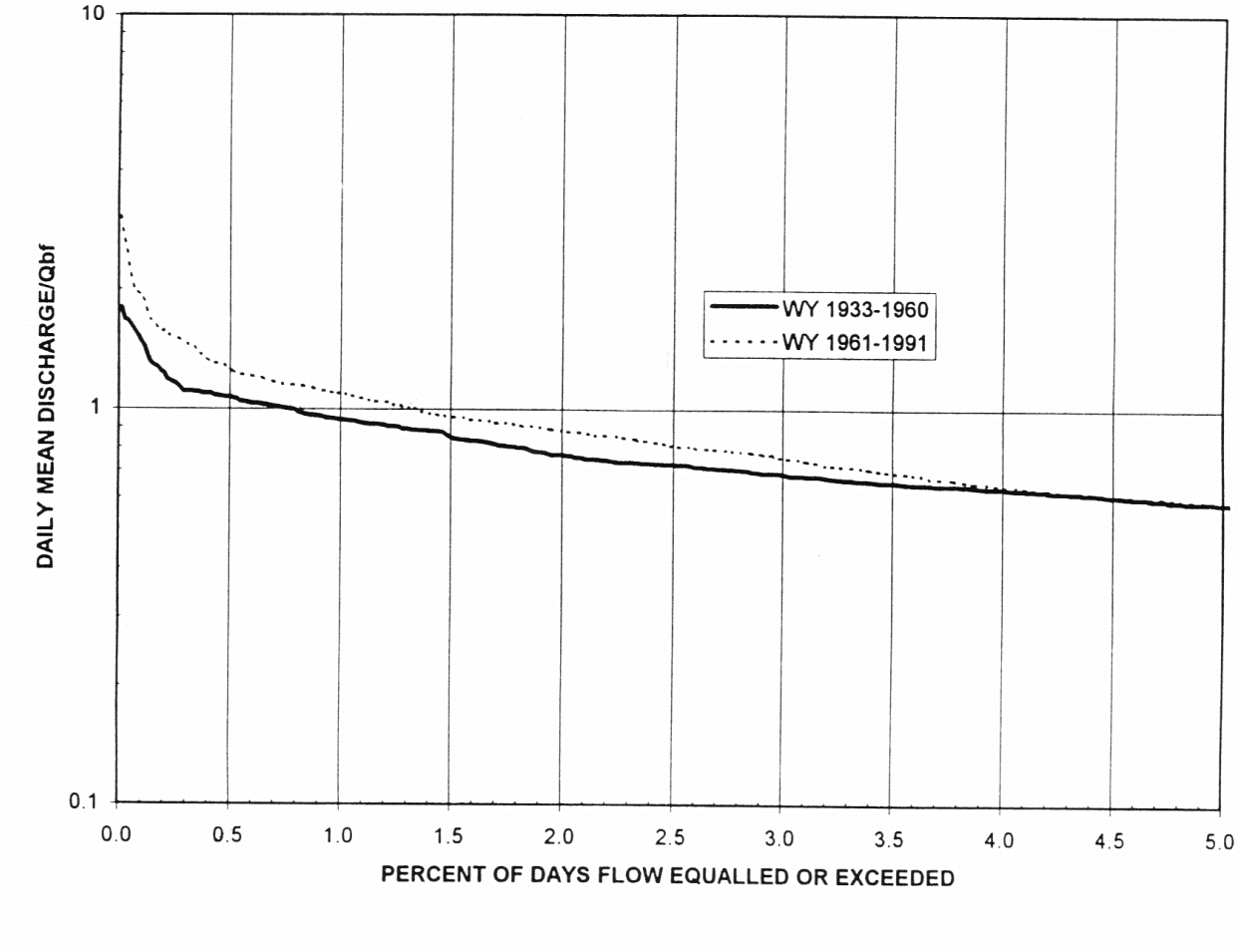
Table 8. Average Acre Feet Per Inch Precipitation

Stream	Average Years	Total Volume of Water for the Year (Acre Feet)	Acre Feet Water Per inch Precip
Deep Creek	1930-1945	76,195	5,366
	1941-1960	93,257	6,504
	1975-1991	83,808	6,208
Twentymile Cr.	1941-1960	38,321	2,589
	1975-1991	36,383	2,618
Drake Creek	1951-1973	10,395	654
Camas Creek		(Data Gap)	

Mean flows were compared for Deep and Twentymile Creeks for years with average precipitation. This comparison showed no statistical change in monthly mean flows (less than plus or minus one standard deviation), when comparing early with later years of record. This is further verified by Table 8 which shows only slight changes in volume of water produced for the different time periods.

Timber harvest can influence the flow regime by increasing total flow, altering peak discharge rate and changing the duration of flows. These changes in energy and sediment transporting capability can cause an alteration in both channel morphology and aquatic habitat. A study by Troendle and Olsen (1991) of the Fool Creek Drainage at the Fraser Experimental Forest in Colorado showed a large increase in duration of flows in the range of 80 to 120% of bankfull as a result of timber harvest. Figure 1 shows similar results for the Deep Creek watershed when comparing the periods 1933-1960 and 1961-1991. The 1-1/2 year return interval event was used as a surrogate for bankfull and nearly doubled in duration in current conditions.

FIGURE 1
FLOW DURATION CURVES,
DEEP CREEK ABOVE ADEL



C. Peak Flow

The data from the Deep Creek gauging station shows that annual peak discharge is dominated by spring snowmelt runoff with most peaks in daily hydrographs occurring in May (peaks occurred in March in Twentymile and Drake Creeks). However, the highest instantaneous peak flows occur as a result of rain on snow events in December and January.

The USGS statistical summaries show that the 100 year event for the gauge at Deep Creek (above Adel) is 8,800 c.f.s. This flow was exceeded in 1964 with 9,420 c.f.s. measured. A Log Pearson Type III analysis was developed to compare peak flows versus recurrence intervals for the periods: 1970 to present, 1946 to 1969 and 1927-present. Figure 2 shows that peak flows for the return interval of 2 to 50 years are higher for the period 1970-present than they were for the period 1923-1997. This indicates that peak flows are increasing in size. This change was not evident at the 100 year return period.

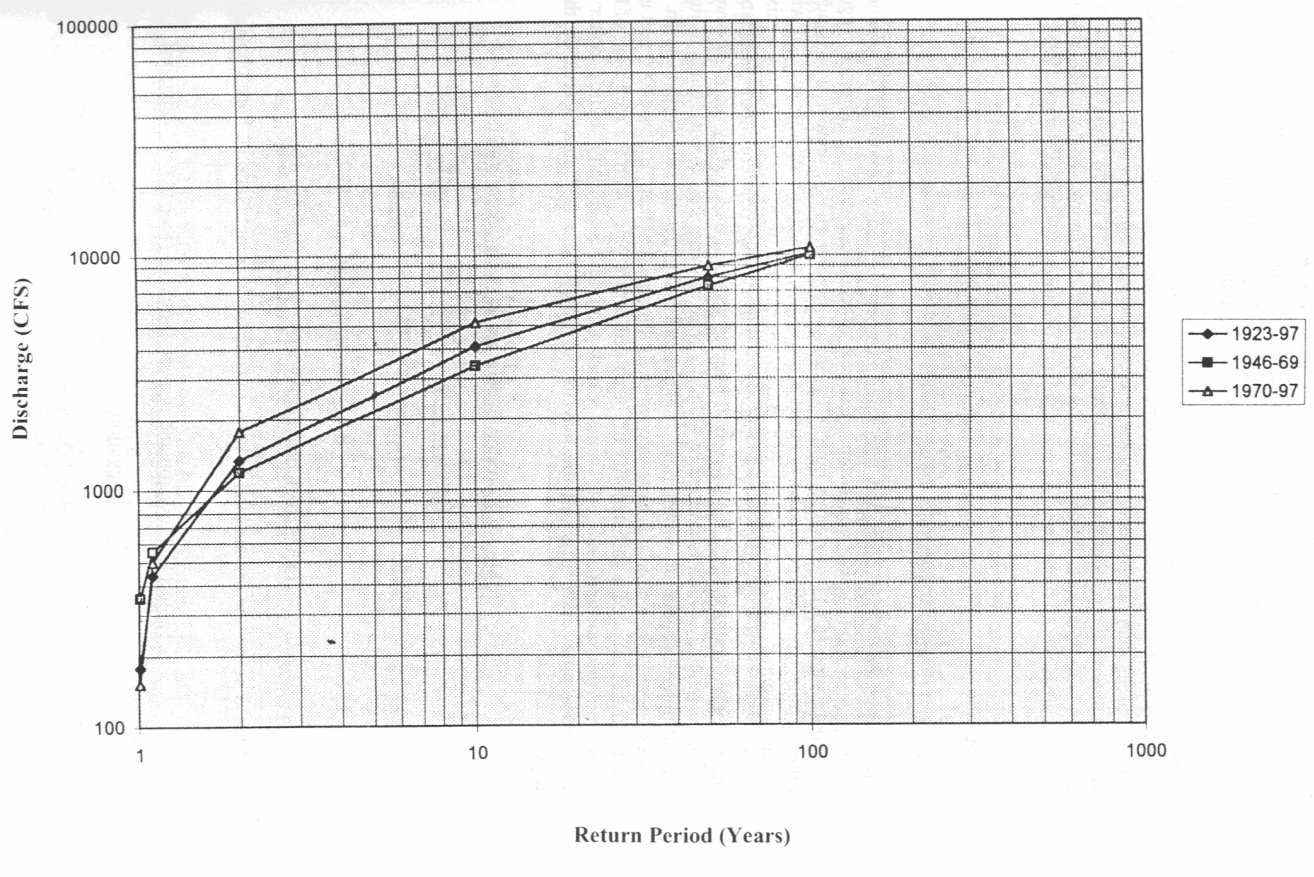
Peak flows have the potential to be higher with increased drainage efficiency from roads. Wemple (1994) focused on the hydrologic interaction of forested roads with stream networks. Wemple found nearly 60% of the road network drained to streams and gullies, and are, therefore, hydrologically integrated with the stream network. The 60% figure from Wemples study was used to estimate new drainage densities for this watershed. Closed roads are considered to contribute to the overall drainage efficiency and are therefore included in Table 9.

Table 9. Overall Drainage Density
(Drainage Density on Combined National Forest System and Private Lands)

Subshed	*Stream Drainage Density (Mi/Mi^2)	Road Density (Mi/Mi^2)	Total Estimated Density (Mi/Mi^2)	Increase in Drainage Network
Mud Creek (01)	1.9	5.1	5.0	160%
Lower Camas Cr. (02)	2.0	2.9	3.8	90%
Horse Cr. (03)	1.6	2.5	3.1	90%
Burnt Creek (04)	1.5	4.4	4.1	170%
Crane Lake (05)	1.4	2.3	2.8	100%
Upper Deep Cr. (06)	2.6	1.7	3.6	40%
Dismal Creek (07)	2.5	2.4	3.9	60%
Willow Creek (08)	2.0	5.1	5.0	150%
Cressler Creek (09)	2.4	2.7	4.0	70%
Big Valley (10)	2.5	0.5	2.8	10%
Lower Deep Cr. (11)	1.7	1.1	2.4	40%
Blue Creek (12)	1.9	1.6	2.8	50%
Peddlers Creek (13)	1.5	1.7	2.5	70%
Drake Creek (14)	~	1.3	~	~
Gibson Canyon (15)	~	1.29	~	~
Upper Twelvemile (101)	1.7	0.4	1.9	12%
Fifteenmile (103)	1.8	2.5	3.3	80%
Twentymile (104)	~	~	~	~

*Stream drainage densities include perennial, intermittent and ephemeral streams.

FIGURE 2
Deep Creek



Canopy removal is also a factor in increased flows. Research indicates that when 20 to 30% of a watershed is in a cut over condition, measurable changes in stream flow can be detected (Troendle 1982). The amount of change depends largely on the vegetation type, intensity of harvest or disturbance and the climatic and physiographic conditions.

Canopy cover on a landscape basis was determined using 1991 ISAT imagery (Table 12). Comparison of this canopy with reference canopy shows that there is more canopy now in forested areas than there was during the reference period. Changes since 1991 have not made a large change to the overall results. Currently, less than 12% of any forested area in a cut over condition is in openings, defined as having less than 20% canopy. Historically, about 8% of the forested areas would have been in openings from fire/insect/disease (Petersen 1998).

Vegetation

A. Upland (Forest) Vegetation

The watershed can be classified into three distinct vegetation groupings of upland forested, riparian and high desert vegetation. Current ecoclassifications for forested vegetation are lodgepole pine (CL), ponderosa pine (CP), mixed conifer (CW), juniper woodlands (CJ) and other (Table 10). Mixed conifer is either a true white fir species or a mixture of white fir and ponderosa pine. The eastern flank of Crane Mountain below 6,500 feet is now a mixed conifer site (Table 11). It was most likely maintained as a more open ponderosa pine association prior to the twentieth century when the fire return interval was uninfluenced by man. The northern part of the watershed, which is drained by Camas Creek running west to east, tends to function as a typical upland vegetation community. It has slopes that generally face north to south. The north slopes are slightly wetter and have true white fir above 6,000 feet. Below 6,000 feet in elevation white fir has invaded a vast majority of the mixed conifer sites with the exclusion of fire. South slopes on the northern side of Camas Creek tend to be typically a little hotter and drier. Ponderosa pine tends to go all the way to the valley floor of Camas Creek on the southern aspects.

Table 10. Forested Ecoclasses in Deep Creek Watershed

Ecoclass Type	Acres*
CL	6,634.10
CW	29,188.11
CP	6,786.97
CJ	4,311.23
Other (Includes nonforest)	18,714.49

*does not include private land or lands outside the Fremont National Forest boundary.

Table 11. Elevation and Aspect Zones for Deep Creek Watershed

Elevation	Acres
4,501-5,000	1
5,001-5,500	3,456

Elevation		Acres
5,501-6,000		67,857
6,001-6,500		42,749
6,501-7,000		23,081
7,000+		14,000
	Total	151,234

Aspect		Acres
Flat		7,736
N		31,642
S		31,724
E		51,822
W		28,304
	Total	151,228

Ponderosa pine with multi-sized understories is dominated with large pine, a mixture of small patches of ponderosa pine regeneration and patches of intermediate size classes. Many of the ponderosa pine sites have been repeatedly entered over the last forty years and have a diminished large tree component. The drier sites have western juniper coming in from the edges as a response to fire exclusion.

Most of the forested stands fall in the category of <25% canopy cover (18%) or 26-55% canopy cover (29%). The large percentage in the 26 to 55% group reflects the increased stand density due to fire suppression during the twentieth century (Table 12).

Table 12. Canopy Cover (Current Condition)*

Cover Class	Acres	% of Watershed Area
Nonforest	16,850	11
Shrubs	57,693	38
< 25%	27,364	18
26 - 55%	43,547	29
56 - 70%	4,796	3
71%	393	<1

*Data taken from Fremont National Forest ISAT.

Current stand density is higher than the historical level in most of the watershed. White fir and mixed conifer stands have high densities that place them at risk to disease, insect attack and density-related mortality.

Mixed conifer that had a large component of ponderosa pine has been entered several times to remove the high value large trees. This practice of "high grading" has left many stands with a large stagnant component of white fir that normally would have been absent in many stands historically. Several of these stands were placed on a management track called delayed regeneration. This prescription was designed to quickly increase the growth of residual thinned white fir to a fourteen inch average stand diameter and regenerate the stand to ponderosa pine.

The process delayed stand regeneration and conversion to ponderosa pine by about forty years. The intent was to capture the growth of residual white fir while providing a commercial product within the Lakeview Federal Sustained Yield Unit.

Juniper woodlands have increased in the current condition due to the change in the fire regimen along with potential climate change. Juniper has invaded the drier sites of the desert edges and also has become more prevalent in the "stringers" common along the southeastern portion of the watershed. Juniper also occurs as a common understory species in at least 1,500 acres of ponderosa pine forest.

Stringers are the forested portion of the landscape that is usually associated with shallow depressions, riparian zones or areas that may collect slightly more soil than the majority of the dry desert landscape. They are areas of slightly higher moisture holding capacity that make it possible to support trees. The stringers are usually ecotones between the riparian zone and the open desert fringe. Many of these stringers on the forested portion in the southern half of the watershed have been entered to remove large ponderosa pine. The environment in these stringers has been changed by entry and resulted in areas that may be marginally stocked compared to historical conditions.

The grass/shrub component has changed with the change of disturbance regimens. Fire exclusion along with drier climatic conditions on the desert fringe has caused a change from herb dominated communities to communities that are dominated by ponderosa pine where moisture will allow it to gain a foothold or western juniper on drier sites. The expansion of juniper woodlands covers a significant area. In many cases there are few herbaceous plants or shrubs in the juniper woodlands because of a noteworthy increase in juniper density and distribution. A similar condition has occurred in some white fir where trees have not been removed or kept in check by frequent fires. The white fir has out competed the understory shrub, herb and grass layer for available light and moisture leaving little vegetation at ground level.

In many areas not capable of supporting tree growth, former herb and native grass dominated communities are now supporting dense stands of shrubs such as big sagebrush and rabbitbrush. Grazing has removed many of the fine grass fuels which limits the potential for fire to carry. Fire now generally requires much drier conditions to start and carry. When they occur, the intensity and severity is greater and substantial change to much of the native understory of perennial grasses or herbs is more likely.

1. Late and Old Forest Structure Assessment

This assessment is based on the definition of late and old structure (LOS) by W. E. Hopkins, Area 4 ecologist for the Deschutes, Fremont, Ochoco and Winema National Forests. LOS describes a timber stand's ability to meet a characterization of attributes that are necessary for certain wildlife species habitat. This is not the classical definition of structure which deals with tree size and canopy layers. Seral stage defines the points in time where a stand passes defined levels of development. It is ecological plant succession in an orderly, slow progression of change in plant community composition in a stand from initial colonization to the attainment of climax vegetation typical of a geographic area (Hopkins et al. 1992).

Definitions of seral stage by Hopkins et al. are lengthy and can be viewed in his publications available at the Fremont National Forest Supervisor's Office. Structural stages (Table 13) are defined as stand initiation, stem exclusion, understory reinitiation and old growth by Oliver and

Larson (1990). They are repeated here for clarity in documenting the current condition of the watershed.

Stand Initiation Stage. After a disturbance, new individuals and species continue to appear for several years.

Stem Exclusion Stage. After several years, new individuals do not appear and some of the existing ones die. The surviving ones grow larger and express differences in height and diameter, first one species and then another may appear to dominate the stand.

Understory Reinitiation Stage. Later, forest floor herbs and shrubs and advance regeneration again appear and survive in the understory, although they grow very little.

Old Growth Stage. Much later, overstory trees die in an irregular fashion, and some of the understory trees begin growing to the overstory.

Table 13. Stand Structure

Stage	Acres	Percent of Forested Acres in the Watershed (76,459 acres)
Stand Initiation (Early Single Strata)	4,514	5.90
Understory Reinitiation (Early Multi Strata)	0	0.00
Stem Exclusion (Mid Open Canopy)	8	<0.01
Stem Exclusion (Mid Closed Canopy)		<0.01
MC-20 (Canopy Cover = 41 - 55%)	12	<0.01
MC-23 (Canopy Cover = 56 - 70%)	25	<0.01
MC-24 (Canopy Cover = 70+%)	3	<0.01
Understory Reinitiation (Multi-strata w/o Lg Trees)		
MM-20 (Canopy Cover = 41 - 55%)	66,772	87.33
MM-23 (Canopy Cover = 56 - 70%)	4,734	6.19
MM-24 (Canopy Cover = 70+%)	369	0.44
Understory Reinitiation (Multi-strata with Lg Trees)		
LM-20 (Canopy Cover = 41 - 55%)	0	0.00
LM-23 (Canopy Cover = 56 - 70%	0	0.00
LM-24 (Canopy Cover = 70+%)	22	<0.01
Understory Reinitiation (Single-strata with Lg Trees)	0	0.00

According to this analysis, there are 22 acres that meet the Hopkins definition of LOS utilizing the data presented in the Fremont National Forest GIS ISAT coverage.

2. Productivity

Condition classes are found in Table 14 and refer to a productivity rating defined in the Forest plan. Associated species are the mixed conifer acres, pine species refers to ponderosa pine and lodgepole refers to lodgepole pine. Refer to the Forest plan for more information. These data were used to provide information on commodity output for the Forest plan.

Table 14. Condition Class for Deep Creek Watershed

Condition	Acres
AH (associated species high productivity)	30,042
AL (associated species low productivity)	422
PH (pine high productivity)	1,738
PL (pine low productivity)	5,245
LH (lodgepole high productivity)	509
LL (lodgepole low productivity)	1,235
O (other)	23,884
PS (pine special)	103
Total	63,178

Current timber production potential is characterized in Table 15 by plant associations.

Table 15. Timber Production Potential

Ecoclass	Average Growth (cu ft/ac/yr)	Range (cu ft/ac/yr)	5%CI	Acres
CL-C1-11	29	20-38	9	0
CL-C1-12	20	13-27	7	2,309.13
CL-G3-15	54	44-64	10	237.13
CL-G4-15	29	24-34	5	0
CL-H1-11	77	52-102	25	219.71
CP-C2-11	47	29-65	18	1,516.51
CP-S2-11	47	33-61	14	0
CP-S2-17	54	46-63	9	0
CP-F1-11	44	33-55	11	5,102.29
CP-H3-13	55	34-76	21	168.37
CP-S1-21	42	28-56	14	0
CW-C3-11	88	45-131	43	107.3
CW-S3-13	116	105-127	11	25,023.97
CW-S1-17	131	80-182	51	0
CW-C4-12	126	93-159	33	47.55
CW-C1-11	114	91-137	23	3,531.97
CW-C4-11	101	72-130	29	477.32
CW-H2-11	59	28-90	31	0

From Plant Associations of the Fremont National Forest (Hopkins 1979).

3. Fire

Wildfires larger than 100 acres in size are shown in Table 16 by year of occurrence. The frequency of starts from lightning caused fire in the Warners is in the lowest range for the forest. Control of wildfires has resulted in a change of potential fire intensity from low to a more moderate regime. Fire severity has changed to a more mixed lethality severity regime due to the build up of ladder fuels and the amount of carbon stored on most sites (Table 17). Insects, disease and increased density-related mortality have increased the dead fuel component of the forested portion of the watershed.

Table 16. Wildfires From 1950 to 1997
(Greater than 100 acres)

	Location				
Year	T	R	Sec	Name	Size (Acres)
pre-1948	38S	21E	02		150
1956	38S	21E	30		11
1951	40S	22E	19	Willow Creek	207
1960	38S	22E	26	Blue Creek	435
1964	38S	22E	22	Blue Creek	170
1964	39S	20E	10	Black Cap	413
1966	39S	21E	01		11
1996	41S	21E	20		20

Fire locations can be found in the Fremont National Forest GIS.

Table 17. Deep Creek Fire Disturbance (Acres)

Frequency	Historic	Current
Frequent	103,222	44,229
Very Frequent	74,323	61,211
Infrequent	2,501	69,280
Very Infrequent	0	5,326
Severity	**Historic**	**Current**
Non-Lethal	74,890	8,274
Mixed	1,995	92,280
Lethal	103,161	79,492

Data source: ICBEMP fire data. Frequency and severity definitions are contained in the documentation for that project.

Table 17 represents the whole watershed. Changes in lethality (severity) and frequency are a result of active fire suppression. Historic fire severity shows a large acreage of lethal and nonlethal severity. Current condition shows a shift to more mixed severity. This data is extrapolated from the ICBEMP Project and only may hold credibility in very broad generalities. The disturbance regime includes the eastern portion of the watershed which is a desert shrub/grass community. Fires were historically frequent but usually lethal in the shrub community because of the intolerance of most shrubs to repeated low intensity fire. Fire maintained the plant community in a more open grass situation. Fires that occur in the grass/shrub community tend to be of a mixed lethality and occur as a mosaic on the landscape. Fire suppression in the forested community may have reduced the severity in that portion of the landscape.

There is an aggressive underburning program on the Fremont National Forest. However, little underburning has been done in this watershed. Some burning to reduce sagebrush competition and improve range condition was done in 1986 along Dismal Creek. An attempt to underburn in

white fir-mixed conifer stands occurred in 1981-82 (Table 18). The results were deemed unsuccessful because of the amount of white fir mortality that occurred. The burn objective was to reduce fuel, while inducing no mortality. Current forest management objectives are somewhat different and reintroducing fire where it was part of the naturally occurring disturbance cycle now fits into the scheme of ecosystem management.

Table 18. Areas Underburned

Name of Area	Year Burned	Acres
Camas	1981	77.59
Burnt Creek	1982	66.81

4. Insects and Disease

Bark beetles have been working in the watershed. Western pine beetle is attacking large ponderosa pine, mountain pine beetle is working in the lodgepole pine and small ponderosa pine and the fir engraver is working on white fir. Fir engraver activity was extensive during the early 1990s but the other bark beetles have been endemic in the forested area and have not caused extensive mortality.

The Modoc budworm has been prevalent in the Warner Mountains for millennia. There were outbreaks of the Modoc budworm in 1982, 1986 and 1990. The insect population rises and wains very quickly in response to a naturally occurring virus. Outbreaks were short lived and little mortality occurred. Typically, Modoc budworm damage results in top kill and the associated reduction in growth. Large scale white fir mortality has occurred as a result of the long drought of the late 1980s and early 1990s. The drought left much of the white fir stressed and susceptible to fir engraver attack. Most insect attacks have been secondary mortality agents that killed trees in an already weakened or stressed condition.

Dwarf mistletoe occurs in ponderosa pine, white fir and lodgepole pine. These mistletoes are species specific and do not spread from one to another. Damage from mistletoe is potentially the greatest in single species stands with multilayered canopies and high density. Stands that have been harvested but have residual infected overstory or infected trees nearby appear to have a high potential to spread mistletoe infection to seedlings and saplings. Mistletoe appears to be on the increase because of these conditions.

Annosus root disease is prevalent in the mixed conifer stands and is especially common in pure white fir stands. Many of these stands have been entered repeatedly and the spread of Annosus is increasing. Attempts to control the spread of Annosus during timber sales using borax on freshly cut stumps were unsuccessful during the 1980s and 1990s. The prescription to treat freshly cut stumps was never completed during timber sale operations. Eglitis et al. has shown that after the second entry into a true fir or mixed conifer stand almost 100% of the white fir will be infected with Annosus (Fremont National Forest 1995).

B. Rangeland

The most obvious rangeland vegetation in the watershed is the sagebrush types: low sagebrush, big sagebrush or silver sagebrush. These shrubs are found throughout the watershed at different elevations, on different soils and on all aspects. Sagebrush shrubs are either dominant or codominant on 91% of the acres in the BLM portion of the watershed.

Range vegetation within the BLM portion of the watershed can be summarized into 11 major groups and separated by land status and subsheds. These groups and the acres in each is shown in Table 21. Public land is 67% of the total acreage (84,298 acres) and the rest is intermingled private land. The largest groups are the low sagebrush-grass (ARAR-Grass) (54%), big sagebrush-grass (ARTRV-Grass) and juniper over these sagebrush communities (JUOC-ARAR-Grass, JUOC-ARTRV-Grass). These groups occupy about 66,500 acres or 79% of the total acres in the BLM portion of the watershed. The most common community (53% of BLM acreage), low sagebrush-grass, is also the most dominant vegetation in every subshed, ranging from 21% of the vegetation in Cressler Creek to 67% in the Big Lake subshed. Big sagebrush-grass is the second most common vegetation type and is also found throughout the watershed (12% of BLM acres) but is less than 20% of the vegetation in the smaller subsheds, Cressler Creek, Big Valley, Drake and Peddlers Creeks.

Juniper-low sagebrush-grass sites are relatively rare, occupying only 4% of the total acres in the BLM portion of the watershed.

Most of the juniper-low sagebrush is found in the Big Valley subshed where it is dominant and in the Big Lake subshed. It is in these subsheds that the old growth or ancient juniper stands are most often found. The other subsheds either have none at all or very little.

The juniper-big sagebrush type occurs on about 9% of BLM-adaministered land and is found in every subshed, except Cressler Creek and Big Valley. It occupies a large part of the Gibson Canyon subshed (26%) and a significant part of the Drake (18%) and Peddlers Creek (15%) subsheds. There are more acres of the juniper-big sagebrush type in these three subsheds than there are the big sagebrush-grass type.

The other less common vegetation types are scattered throughout the subsheds in relatively low amounts except for antelope bitterbrush and mountain mahogany communities which are a significant portion (707 acres) of the Drake Creek subshed. There are only 2,403 total acres (3% of BLM acres) dominated by these vegetation types, but these communities are very important as habitat for deer and other wildlife species.

Current conditions of the vegetation within the watershed and within BLM allotments have been determined using the Ecological Site Inventory Method (ESI). This method compares the species composition of the existing community with the potential species composition of that site based on soils, topography, precipitation and elevation. The ESI method then places each site in one of the following seral stages: early, mid, late and climax. Climax resembles potential and early has less than 25% of its plant production in potential vegetation.

Only about 1% of the acreage in the BLM portion of the watershed is in the early seral stage and only about 0.1% is in the climax stage. Most of the acreage is in the mid-seral stage (77.5%), 19% is in the late stage, and 2.5% in the unknown category (Table 19). The condition of the public land (excluding the private) is a little different with only 0.3% in the early seral stage, 0.2% in the climax, 23% in late, 75% in mid and 1% is unknown. On the private lands, there is 2% in early seral stage, 82% is mid, 10% is late and 6% is unknown.

There is variation in the condition of the vegetation based on vegetation type. The ecological condition by vegetation community for all acres within the BLM portion of the watershed is shown in Table 19. Three of the four most common vegetation types, low sagebrush-grass (ARAR-Grass), big sagebrush-grass (ARTRV-Grass) and juniper-low sagebrush-grass (JUOC-ARAR- Grass), have very similar condition ratings with about 75% in mid-seral and 25% in late

seral. Juniper-big sagebrush-grass (JUOC-ARTRV-Grass) is somewhat different with 95% in the mid-seral condition. This is expected as junipers have invaded the big sagebrush communities in the last 100 years and there has been a reduction in herbaceous vegetation. The increase in junipers and loss of herbaceous vegetation has resulted in a lower ecological condition rating for some of these areas. These general relationships are about the same whether on BLM or private land.

Table 19. Acres by Vegetation Type and Percent of Vegetation Type by Seral Condition
BLM Portion of Watershed

Vegetation type	Acres/Watershed/ BLM Allotments	Percent of Total Acres in Vegetation Type by Seral Stage				
		Early	Mid	Late	Climax	Unknown
ARAR-Grass	45,114	0.4%	76%	24%	0%	0
ARTRV-Grass	10,454	1.5%	71%	27%	0%	0
JUOC-ARAR-Grass	3,027	0%	78%	22%	0%	0
JUOC-ARTRV-Grass	7,903	0.6%	95%	4%	0	0.6%
PUTR-CELE-Grass	2,403	0	49%	42%	5%	4%
ARCA	367	0	40%	19%	0%	41%
TREE Types	878	0%	48%	0%	0%	52%
Grasslike	2,640	17%	30%	4%		48%
TOTAL	84,276	1%	19%	77.5%	0.1%	2.5%

The amount of sagebrush and the species composition of the understory grasses determine the ecological condition stage for these plant communities. The low sage and big sagebrush sites in the mid-seral stage tend to be dominated by Sandberg's bluegrass and/or bottlebrush squirreltail. Other common grass species included Thurber's needlegrass, Idaho fescue and bluebunch wheatgrass. Low sagebush sites in late seral condition generally had Idaho fescue as one of the dominant understory grasses with at least 10-20% of the composition. These sites often contained a variety of other grasses such as bottlebrush squirreltail and bluebunch wheatgrass. In big sagebrush sites in the late seral stage, Idaho fescue is still one of the dominants but bluebunch wheatgrass is at least as common. To be in the late seral stage, a site must have a variety of grasses. If Idaho fescue or bluebunch wheatgrass is common, then other grasses will also be present.

Low sagebrush sites with a juniper overstory are relatively small areas (4%), but are found throughout the watershed (Table 21), and 22% of the type is in late seral condition (Table 19). Idaho fescue is the dominant understory grass and it is on these sites that much of the old growth juniper is found.

In the other less common vegetation types there is variation in ecological condition with the bitterbrush (PUTR) and mountain mahogany (CELE) communities having 49% in mid-seral, 42% in late and 5% in the climax stage.

On National Forest System lands, riparian vegetation in forested areas and restricted carry on areas is generally in proper functioning condition (Table 24). Meadow areas have typically been degraded, but recent improvement has these riparian areas on an upward trend for the most part.

Table 20. Total Acres and Percent of Acres by Subshed by Seral Stage

	Seral Stage					Total
Subshed	Early	Mid	Late	Climax	Unknown	Acres
Gibson Canyon	0	85	14	0	0.3	13,851
Lower Deep Creek	0	60	27	2	11	6,580
Cressler Creek	0	96.5	3.5	0	0	2,492
Big Valley	0	94	6	0	0	4,824
Drake Creek	0	85	11	0	4	7,494
Peddlers Creek	2	93	5	0	0	6,488
Crane Lake	1	60	34	0	5	5,748
Big Lake	2	73	23	0	2	36,731
Total (Percent)	1	78.9	19	0.1	1	100
Total (Acres)	829	65,553	15,857	0	2,036	84,276

There are some relationships between ecological condition of the vegetation and the location of that community within the watershed. The distribution of seral stages within subsheds can be seen in Table 20. Only the Big Lake subshed had a distribution of seral stages similar to the overall distribution described earlier. The Big Lake subshed as seen on Map 2 is the biggest one within the BLM allotments and is in the north and east portion of the watershed. Only Crane Lake (34%) and Lower Deep Creek (27%) subsheds had a higher percentage of acres in late seral condition. Lower Deep Creek subshed had the only vegetation community in climax condition. The greatest amount of late seral and climax vegetation that occurs in these subsheds is found along the western edge of the watershed and adjacent to the National Forest. These areas have a higher elevation (5,800-6,300 feet) and greater precipitation than most of the watershed within the BLM allotments. The climax vegetation is a mountain mahogany-Idaho fescue community along the south slopes of Deep Creek on fairly steep terrain. The north facing aspect and the elevation combine to increase effective precipitation on this site, thereby maximizing plant production. The steep slope protected the community from the historical excessive grazing that occurred in many areas. Current livestock management results in only slight to no utilization on this site. These two subsheds also had the largest number of acres in the unknown category because of the large amount of private land.

The Cressler, Drake, Big Valley and Peddlers subsheds have 85% or more of their acreage in mid-seral condition. These are the smallest subsheds within the BLM portion of the watershed and have larger percentages of intermingled private land. As a result, there are not large blocks of public land that were too isolated to be impacted from historical uses such as excessive grazing, wood cutting and recreational uses.

There is little known about the condition of the small and scattered populations of aspen, willow and snowberry. It appears that the aspen patches in the watershed are being slowly replaced by juniper stands because of the lack of fire. There have been 63 reported fires in the watershed

between 1980 and 1997, but only three were over 100 acres and only five were over two acres. The big three were 475, 200 and 150 acres.

Table 21. Acres of Vegetation Type by Subshed and Land Status
BLM Portion of Watershed

Vegetation type and Dominant Species	Land Status	Gibson Canyon	Lower Deep Creek	Cressler Creek	Big Valley	Drake Creek	Peddlers Creek	Crane Creek	Big Lake	Total
ARAR-Grass										
SIHY, POSE	BLM	5,215	2,554	539	1,232	1,374	2,248	852	21,128	35,142
FEID	TOTAL	5,236	3,212	539	1,232	4,125	3,574	2,541	24,665	45,124
ARTRV-Grass										
SIHY	BLM	1,836	1,038	350	94	131	565	598	2,381	6,993
AGSP, FEID	TOTAL	1,863	1,629	350	94	729	747	1,344	3,698	10,454
PUTR CELE										
Types AGSP	BLM	0	170	0	0	18	60	0	609	857
POA, FEID	TOTAL	0	247	0	0	707	313	0	1,136	2,403
ARCA-ELTR	BLM	0	16	0	0	136	0	0	145	297
PONE, POA	TOTAL	0	16	0	0	136	0	0	215	367
CHNA	BLM	333	0	0	0	0	0	0	0	333
STCO, BRTE	TOTAL	333	0	0	0	0	0	0	0	333
JUOC-ARAR										
Grass	BLM	144	262	25	1,199	0	0	0	1,118	2,748
SIHY, FEID	TOTAL	179	262	25	1,199	0	196	0	1,166	3,027
JUOC-ARTRV										
Grass SIHY	BLM	3,566	184	0	0	346	468	0	787	5,351
AGSP, FEID	TOTAL	3,710	246	0	0	1,338	999	50	1,560	7,903
TREE types										
ABCO, PIPO										
ARTRV, FEID	BLM	0	1,410	0	0	0	0	98	6	244
`AGSP	TOTAL	0	396	0	0	0	0	420	62	878
GRASSLIKE										
CAREX, DECE										
JUNCU, PONE	BLM	32	0	0	0	38	496	0	219	785
AGCR	TOTAL	52	350	0	0	249	659	292	1,038	2,640
ROCKLAND	BLM	2,089	171	0	0	84	0	134	1,268	3,746
	TOTAL	2,142	222	0	0	104	0	202	1,281	3,951
UNKNOWN	BLM	0	0	0	0	0	0	39	20	59

Vegetation type and Dominant Species	Land Status	Gibson Canyon	Lower Deep Creek	Cressler Creek	Big Valley	Drake Creek	Peddlers Creek	Crane Creek	Big Lake	Total
	TOTAL	336	0	1,578	2,299	206	0	899	1,890	7,228
GRAND	BLM	13,215	4,535	914	2,525	2,127	3,837	1,721	27,681	56,555
TOTAL	TOTAL	13,851	6,580	2,492	4,824	7,594	6,488	5,748	36,731	84,298

C. Noxious Weeds

Noxious weeds such as Hoary cress (Cardaria draba), Canada thistle (Cirsium arvense), Bull thistle (Cirsuim vulgare), Diffuse knapweed (Cenaurea diffusa), Spotted knapweed (Cenaurea maculosa), Field bindweed (Convolvulus arvensis), Klamath weed (Hypericum perforatum), Mediterranean sage (Salvia aethiopis) and Yellow toadflax (Linaria vulgaris) have been identified in several areas (Map 5). Two sites of Hoary cress were located. Several sites of Canada thistle have been identified along with 10 sites of Bull thistle. One site of Spotted knapweed was located on National Forest System land approximately 1/2 mile west of Deep Creek campground along the North Fork Deep Creek and one site of Diffuse knapweed located on Oregon State Highway 140. One site of Field bindweed was located west of Adel. Klamath weed was inventoried in two locations. Mediterranean sage was observed on 13 sites. One site of Yellow toadflax was sited on Oregon State Highway 140 at the Mud Creek Campground turn off. The weeds seem to be expanding each year.

D. Riparian Vegetation

An estimate of the total acres of riparian vegetation is shown in Table 22 for National Forest System land. The majority of riparian acres support coniferous and deciduous tree cover. Herbaceous meadows are the second greatest vegetation type characterizing riparian acres. Willow communities and the other shrub types make up the remainder.

Table 22. Riparian Vegetation Acres by Subshed

Subshed	Conifer	Aspen	Cottonwood	Willow	Sage	Herb	Total
Gibson Canyon	0	0	0	0	0	0	0
Drake Creek	19	1	0	0	0	0	20
Peddlers Creek	3	0	0	0	0	0	3
Blue Creek	0	0	0	1	0	0	1
Lower Deep Creek	0	4	0	0	3	1	8
Big Valley	0	0	0	0	0	0	0
Cressler Creek	34	86	0	42	27	24	213
Willow Creek	188	46	1	19	15	97	366
Dismal Creek	79	303	0	121	15	91	609
Upper Deep Creek	168	379	26	151	16	118	858
Crane Lake	231	10	0	10	18	2	271
Burnt Creek	198	167	0	63	25	161	614
Horse Creek	134	142	0	25	44	60	405
Lower Camas Creek	235	96	0	92	75	139	637
Mud Creek	246	61	0	43	35	168	553

Subshed	Conifer	Aspen	Cottonwood	Willow	Sage	Herb	Total
Twentymile Creek	0	0	0	0	0	0	0
Fifteenmile Creek	58	220	0	72	48	52	450
Upper Twelvemile Cr.	12	229	0	17	15	27	300
Totals	1,605	1,744	27	656	336	940	5,308

The vast majority of riparian types on Forest Service livestock allotments are in fair or good forage condition and display mid to late seral ecological status. Most riparian areas on these allotments, with the exception of the lowest elevation low gradient reaches and areas heavily impacted by roads, are in fair to good condition from a vegetative, soil and stream characteristic standpoint. Some of the lower gradient reaches are somewhat deficient in hardwood vegetation.

PFC ratings have been conducted on a number of stream reaches on the forest and were used to classify pastures as being in satisfactory or unsatisfactory condition (Table 23).

Table 23. PFC Ratings

Allotment	Pasture	Stream	Sensitivity	PFC Class
Barley Camp				
	Deep/Mosquito	W. Br. Dismal Cr.	High	Satisfactory
	Dismal Creek		High	Satisfactory
	Spray	N.F. Twelvemile Cr.	High	Satisfactory
	Frakes Cabin	Barley Camp Cr.	High	Unsatisfactory
	Barley Camp	Fifteenmile Cr.	Moderate	Unsatisfactory
	Cressler Creek		Moderate	Unsatisfactory
Crane/Kelly				
	Burnt Creek	Burnt Cr.	High	Satisfactory
		S.F. Willow Cr.	Moderate	Satisfactory
		Willow Cr.	Moderate	Satisfactory
	Burnt Cr. Rip.	Burnt Cr.	High	Satisfactory
	Willow Cr.	Willow Cr.	Moderate	Satisfactory
	Willow Cr. Rip.	Willow Cr.	High	Satisfactory
Crane Mountain				
	Crane Mountain	N.F. Willow Cr.	Moderate	Satisfactory
		M.F. Deep Cr.	High	Satisfactory
Horse Prairie (Hickey)		N/M		
Horse Prairie				
	Horse Prairie	Horse Prairie Cr.	Moderate	Satisfactory
	Burnt Cr. Rip.	Burnt Cr.	High	Satisfactory
	Twin Springs	Horse Cr.	High	Satisfactory
Little Cove		N/M		

Allotment	Pasture	Stream	Sensitivity	PFC Class
McDowell				
	McDowell	S.F. McDowell Cr.	High	Satisfactory
		N.F. McDowell Cr.	High	Satisfactory
	Twelvemile	Twelvemile Creek	High	Satisfactory
Porcupine				
	Porcupine	Porcupine Creek	High	Satisfactory
Rogger Peak				
	Rogger Meadow	Burnt Creek	High	Satisfactory
	Summit Prairie	Summit Prairie Creek	High	Satisfactory
Squaw Butte				
	Upper Squaw	Mud Creek	High	Satisfactory

PFC = Properly Functioning Condition: a methodology to evaluate if streams are functioning in a way to maintain proper riparian and hydrologic attributes.

Riparian vegetation types on the BLM portion of the watershed are represented by the silver sagebrush-grass (ARCA) types which occur along or around the drier riparian areas and the grasslike types which include sedges, rushes and bluegrass species (CAREX, JUNCO, POA, PONE) (Table 21). There are stringers of willows occurring along Parsnip, Camas and Deep Creeks but they were too small to be mapped separately.

The condition of riparian areas which include the silver sage type and some of the grasslike and tree types is not well quantified by the ESI method. The silver sage (ARCA) communities had 40% in mid and 19% in late seral but there was 41% unknown. The large percentage of unknown is due to the shape and size of these communities. Silver sage communities in this area tend to be stringers and strips along riparian zones and are big enough to map but too small or isolated for vegetation transects. The tree and grasslike types also had larger percentages of unknown (52% and 48%) because about two-thirds of these areas are on private land and much of that land was not sampled.

Table 24. Summary of Proper Functioning Condition Assessments of Stream Reaches on BLM and National Forest System Lands

	% Miles of BLM Stream Reach	% Miles of USFS Stream Reach
Proper Functioning Condition	66	69
Functioning at Risk Upward Trend	25	26
Functional at Risk Trend Not Apparent	6	3
Nonfunctional	1.5	3
Not Rated	1.5	~

The PFC method does not quantify ecological condition but does indicate the trend of the vegetation present. Proper functioning condition surveys showed results for Deep, Parsnip, Drake and Camas Creeks (Table 24). It appears that vegetation on most of the riparian areas is stable or in an upward trend. This correlates well with current grazing management which excludes 66% of these pubic land reaches from grazing and 25% is grazed only in the spring

every other year. The remaining 9% is managed under a rotation system using stubble height as an indicator of use. These management techniques should improve vegetation conditions along riparian areas and the PFC survey tends to indicate that. There is not much information on the condition of private land riparian areas.

E. Sensitive Plants

Oregon Semaphore grass (Pleuropogon oregonus) grows on private land on both sides of Oregon State Highway 140 where Mud Creek crosses the highway. It is a Priority 1 in the Oregon Natural Heritage Plan (1998) and is on the sensitive plant species lists for BLM and USFS Pacific Northwest Region. It is to be federally listed. This grass is found on swampy ground, wet meadows and stream banks and is threatened by cattle and drought. This site covers less than one acre and is one of three for the plant in the world. The other sites are located in Harney and Grant counties in Oregon.

Prostrate buckwheat (Eriogonum prociduum) is found on dry, volcanic slopes and hills and is considered "an ash soil species". One population of two acres grows on Sagehen Butte with low sage and other drought tolerant species. In the Oregon Natural Heritage Plan (1998) it is a Priority 1; for the BLM it is on the Sensitive Plant Species List and is a plant taxa which is threatened or endangered throughout its range. It is not known to occur on National Forest System lands. There are six populations elsewhere in Lake County and it grows in California.

Blue-leaved penstemon (Penstemon glaucinus) is another "ash soil" species. It is found on fine, ashy soils or weathered tuff and can be in association with mixed conifers or sagebrush steppe at high elevations. One population on three acres grows on National Forest System land. It has not been found on BLM land. In the Oregon Natural Heritage Plan it is a Priority 1, and it is on the USFS Pacific Northwest Region Sensitive Species List. Because of its new listing, it will become a BLM sensitive plant species. It also occurs in Klamath County, Oregon.

Warner Mountain bedstraw (Galium serpenticum spp. warnerense) is found on steep slopes above active talus slopes above 4,700 feet elevation. Three populations on 289 acres grow on National Forest System land. To date none is known to occur on BLM-administered land. It also occurs in California. It is on the Priority 1 list of the Oregon Natural Heritage Plan and on the USFS Pacific Northwest Region Sensitive Species List.

Dwarf lousewort (Pedicularis centranthera) is another of the ash soil species found on hillsides above Deep Creek Canyon and on Fish Creek Rim. Five populations cover 20 acres of BLM-administered land. None is known to occur on National Forest System land. One population of 40 acres occurs elsewhere in Lake County. It also occurs on the Malheur National Forest in Harney County, Oregon and in Nevada. This species appears to respond favorably to fire with the only threat at present being grazing animals. It occurs under mixed conifers and on open slopes of juniper with very sparse or low diversity. It is a Priority 3 in the Oregon Natural Heritage Plan (species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range), on the sensitive "watch list" for the BLM and does not appear on the USFS Pacific Northwest Region Sensitive Species List.

Nodding melica grass (Melica stricta) is found on rocky slopes of low sagebrush flats and cliff edges among the rocks, such as Fish Creek Rim. It grows in three populations covering about 50 acres of National Forest System land and five populations covering about eight acres of BLM-administered land. It also occurs in four other counties in Oregon and in California and Nevada.

It is a Priority 4 in the Oregon Natural Heritage Plan, so it is a plant taxa of concern and on the "Monitor List" (taxa of concern which are not currently threatened or endangered: taxa which are very rare but are currently secure). This grass is on the USFS Pacific Northwest Region Sensitive Species List and on the BLM sensitive "watch list".

Sierra onion (Allium campanulatum) grows in well drained flat dry ground or shaded areas, rills and gravel washes. It grows in 37 locations covering 161 acres on National Forest System land. It also occurs on BLM-administered land. It has been "considered but rejected as too common" by the Oregon Natural Heritage Plan and is no longer being monitored by the BLM. It is listed on the USFS Pacific Northwest Region Sensitive Species List, but is proposed to be dropped.

Dismal Swamp Botanical Special Interest Area

The Dismal Swamp area is the only high montane (7,000 feet) freshwater marsh known on the Modoc National Forest. This freshwater marsh area of approximately 160 acres contains a diverse assemblage of plants which makes it a rare habitat type in California. Dismal Swamp is the southern most extent of the range of a rare bog birch which is proposed as a "Listed Species" by the California Native Plant Society. Dismal Swamp also contains the highest elevation occurrence of stoloniferous pussytoes, a Region 5 sensitive plant. The area provides beautiful spring wildflower displays that have been photographed and featured by popular nature magazines. The Dismal Swamp area has been recommended for designation as a botanical special interest area.

Quamasia Quamash Special Management Area (Botanical)

This area, originally established and approved in 1939, will continue to be managed to maintain a colony of common camas (Quamasia quamash) considered at the time of establishment as a vanishing species. The area is designated Management Area 7 in the Forest plan.

Stream Channel

A. Fluvial System

A list of the system's major streams and tributaries is found in Table 2 (Characterization-5).

Streams in the Deep Creek watershed include perennial, intermittent and ephemeral channels. Table 25 is a breakdown of stream miles by subshed. Map 7 shows the distribution of these stream types by subshed.

Table 25. Stream Miles by Subshed

Subshed	Perennial Miles	Intermittent Miles	Ephemeral Miles	Total Miles
Mud Creek (01)	16	19	6	41
Lower Camas Cr. (02)	22	31	12	65
Horse Cr. (03)	5	9	5	18
Burnt Creek (04)	10	4	6	20
Crane Lake (05)	9	7	8	25
Upper Deep Creek (06)	19	14	2	35

Subshed	Perennial Miles	Intermittent Miles	Ephemeral Miles	Total Miles
Dismal Creek (07)	9	10	12	31
Willow Creek (08)	14	9	4	27
Cressler Creek (09)	6	9	6	21
Big Valley (10)	9	7	3	19
Lower Deep Creek (11)	11	3	5	19
Blue Creek (12)	14	13	3	29
Peddlers Creek (13)	10	5	3	17
Drake Creek (14)	~	~	~	~
Gibson Canyon (15)	~	~	~	~
Upper Twelvemile (101)	4	1	2	7
Fifteenmile (103)	2	4	2	8
Twentymile (104)	~	~	~	~

Physical features for stream channels in Table 26 were obtained from Fremont National Forest and Lakeview Resource Area, Lakeview District, Bureau of Land Management Level II Stream Inventories. PFC analyses were performed by interdisciplinary teams for the entire reach length on BLM managed streams. Forest Service PFC analysis was done on key areas of allotments, but did not encompass the entire stream length.

Table 26. Physical Features of Stream Channels

Reach	Mean Riffle Width Ft.	Pools/ Mile (#)	LWD/ Mile (#)	Pools Mile Deeper than 2.6 Ft.	Gradient %	Unstable Banks %	PFC
Mud Creek Subshed (01)							
Mud Creek							
1	14	23	9	2	6	~	PFC
2	6	13	0	4	1	~	NA
Horse Creek Subshed (03)							
Horse Creek							
1	10	30	7	3	5	~	~
5	15	12	8	3	5	~	~
Burnt Creek Subshed (04)							
Burnt Creek							
2	11	43	0	3	4	~	~
3	9	23	7	0	12	~	~
4	10	40	1	10	2	~	~
6	6	0	0	0	1	~	~
8	6	13	1	1	5	~	~
9	5	9	1	6	1	~	~

Reach	Mean Riffle Width Ft.	Pools/ Mile (#)	LWD/ Mile (#)	Pools Mile Deeper than 2.6 Ft.	Gradient %	Unstable Banks %	PFC
Upper Deep Creek Subshed (06)							
Deep Creek - South Fork							
1	8	78	0	0	7	6	~
2	8	101	0	0	9	2	~
3	7	28	0	0	10	16	~
Deep Creek-Middle Fork							
1	23	22	11	18	2	6	~
2	22	8	14	4	4	3	~
3	18	26	6	15	5	0	~
4	17	21	0	11	2	6	PFC
5	8	34	3	0	8	1	~
6	7	13	5	0	19	2	~
North Fork Deep Creek							
1	13	40	2	0	8	~	AR^
Mosquito Creek							
1	9	55	31	~	5	~	~
2	10	56	11	~	16	~	~
3	5	50	0	~	4	~	~
4	6	46	2	~	10	~	~
Dismal Creek Subshed (07)							
Dismal Creek							
2	14	28	10	3	7	~	~
3	9	39	0	2	2	~	~
Willow Creek Subshed (08)							
Polander Creek							
2	7	111	7	0	4	~	
3	7	22	9	0	10	~	
Willow Creek							
1	7	35	8	0	3	~	PFC
2	7	63	20	1	4	~	~
3	7	30	5	1	1	~	AR^
4	10	15	0	5	1	~	~
6	6	87	113	0	1	~	~
7	4	84	72	0	4	~	PFC
8	5	73	94	0	20	~	~
9	4	75	60	0	9	~	~

Reach	Mean Riffle Width Ft.	Pools/ Mile (#)	LWD/ Mile (#)	Pools Mile Deeper than 2.6 Ft.	Gradient %	Unstable Banks %	PFC
Lower Deep Creek Subshed (11)							
5(BLM)	21	40	4	15	2.3	29	PFC N(0.35MI)
6(BLM)	26	20	2	5	0.5	27	FAR^
Blue Creek Subshed (12)							
Blue Creek							
1(BLM)	27	49	1	23	2.5	7	PFC
2(BLM)	24	28	1	11	0.2	34	FAR^
3(BLM)	33	25	13	23	3.0	1	FAR>
Peddlers Creek Subshed (13)							
Parsnip Creek							
1(BLM)	5	83	0	8	2.0	32	FAR^
2(BLM)	3	45	9	9	1.3	21	PFC
3(BLM)	5	100	0	42	2.0	1	PFC
4(BLM)	8	55	2	3	2.0	19	PFC
5(BLM)	10	58	19	2	9.0	9	PFC
Drake Creek Subshed (14)							
Drake Creek							
1(BLM)	22	18	2	9	1.0	2	PFC
2(BLM)	26	44	0	11	1.0	0	PFC
3(BLM)	18	29	0	7	1.0	1	PFC
4(BLM)	22	28	8	6	2.5	19	PFC
5(BLM)	20	39	22	14	2.5	6	PFC
6(BLM)	6	65	12	4	1.4	20	FAR^
Roaring Spring Fork							
1(BLM)	12	21	42	5	1.3	2	PFC
2(BLM)	16	27	5	11	1.2	0	PFC
Gibson Canyon Subshed (15)							
Lower Deep Creek							
1(BLM)	43	34	1	32	2.4	34	PFC
2(BLM)	41	25	0	25	1.4	28	PFC
3(BLM)	37	9	0	8	0.6	31	PFC
4(BLM)	32	23	2	14	1.7	13	PFC

Water Quality

A. General Discussion

Water quality parameters of stream temperature, fine sediment and macroinvertebrates are analyzed for current conditions. State parameters of dissolved oxygen, bacteria, total dissolved solids and toxic pollutants are not addressed as separate subjects because data is not available.

The Oregon Department of Environmental Quality developed a list of streams that do not meet requirements of the Clean Water Act for inclusion in the Environmental Protection Agency (EPA) 303(d) list. Data were provided to the State from the Forest Service and Bureau of Land Management. Streams and criteria listed in the draft 303(d) list for 1998 are shown in Table 27 and on Map 8.

Table 27. Streams on Draft 1998 EPA 303(d) List

Water Body	Boundaries	Comment	Segment
Twelvemile Creek (Twentymile Creek)	Mouth to N.F. Boundary	Temperature- Summer	42C- TWEL0
Fifteenmile North	Mouth to Headwaters	Temperature-Summer	42C-FIFTO
Twentymile Creek	Mouth to Headwaters	Temperature-Summer	42C-TWEN0
Willow Creek	Mouth to Headwaters	Temperature-Summer	42C-WILL0
Horse Creek	Mouth to Headwaters	Temperature-Summer	42C-HORS0
Mud Creek	Mouth to Headwaters	Temperature-Summer	42C-MUD0
Parsnip Creek	Mouth to Headwaters	Temperature-Summer	42C-PARS0
Polander Creek	Mouth to Headwaters	Temperature-Summer	42C-POLA0
Porcupine Creek	Mouth to Headwaters	Temperature-Summer	42C-PORC0
Burnt Creek	Mouth to Headwaters	Biological Criteria/ Temperature-Summer	42C-BURN0
Camas Creek	Mouth to Headwaters	Temperature-Summer	42C-CAMA0
Deep Creek	Mouth to Headwaters	Temperature-Summer	42C-DEEP0
Drake Creek	Mouth to Headwaters	Temperature-Summer	42C-CRAK0

All streams are listed for not meeting State of Oregon temperature standards. Burnt Creek is also listed for biological criteria which was determined to be degraded by macroinvertebrate species composition.

B. Fine Sediment

Physical samples were taken from potential spawning habitat areas or potential redd areas in gravel/cobble reaches of pool tail outs. Thirteen reaches were sampled within the National Forest boundary and two within the BLM boundary. An average of the five samples per reach was obtained and is shown in Table 28. Sieve analysis was performed in the laboratory to determine the percent fines by weight. Sieve sizes were selected using references from Reiser and Bjornn (1979). Detrimental fines are those passing the 6.4 mm sieve and smaller in excess of 25 to 30% of the substrate material.

Table 28. USFS Physical Measurements of Fines in Spawning Habitat

Subshed	Major Stream/Tributary	Elevation	% Fines < 6.4 mm	Embryo Survival
Mud Creek (01)				
	Mud Creek	6,320	40	20
	Mud Creek	6,140	19	70
	Porcupine Creek	6,500	23	65
Burnt Creek (04)				
	Burnt Creek	6,200	4	95
		5,900	32	45
Upper Deep Creek (06)				
	South Fork Deep Creek	6,080	18	70
	Mosquito Creek	6,400	19	70
Dismal Creek (07)				
	Dismal Creek	5,800	12	85
		6,900	17	80
Willow Creek (08)				
	Willow Creek	6,120	29	40
		6,060	7	90
		5,720	9	90
Lower Deep Creek (11)				
	Deep Creek	6,500	19	70
		5,480	28	40
Drake Creek (12)		5,500	27	40
		Average	20	65

C. Water Temperature

Water temperatures were taken using continuous recording thermographs. Results of stream temperature monitoring are in Table 29.

Table 29. Stream Temperature (ºC)

Subshed/Stream	Elevation		Maximum 7-Day Average Maximum Temp ºC 1992	1993	1994	1995	1996	1997
Mud Creek (01)								
Mud Creek	6,120	22.2	20.7	23.1	22.2	21.0	19.9	
Porcupine Creek	6,500	19.4	19.7	23.0	19.2	21.0		
	6,520	20.7						
Lower Camas Creek (02)								
Camas Creek	5,500		19.0	26.8	23.5			
Rosa Creek	5,940		15.5					
Horse Creek(03)								
Horse Creek	5,600		21.2					
	5,760		16.1	25.3	25.0			
Burnt Creek (04)								
Burnt Creek	5,640			28.6	25.9	26.3		
	5,910				24.7	26.3		
	6,240	16.1	23.3	20.5	22.2	23.9	22.8	
	6,600				5.9			
Crane Lake (05) No perennial stream								
Dismal Creek (07)								
Dismal Creek	5,760		16.1	18.2	16.2		18.1	
Willow Creek (08)								
Willow Creek	5,760			26.1	22.3	23.7	21.9	
Polander Creek	5,620		25.2	20.9	15.9			
Lower Deep Creek (11)								
Deep Creek	5,700	20.5	24.2	20.5		23.6		
	5,519		20.5	26.9	25.0		26.1	
	5,459		22.4	28.3	26.2	24.2	26.0	
Blue Creek (12)								
Camas Creek	5,442		20.9	29.0	20.6	24.0	24.9	
	5,415		20.4	30.2	24.6	26.0	25.2	
Peddlers Creek (13)								
Parsnip Creek	5,478		17.1		19.1	20.4	19.8	
	5,130		20.4		23.0	24.0	23.6	
Drake Creek (14)								
Drake Creek	5,458						22.4	
	4,998						26.4	

Subshed/Stream	Elevation	Maximum 7-Day Average Maximum Temp °C 1992	1993	1994	1995	1996	1997
Gibson Canyon (15)							
Deep Creek	4,980		20.8	26.8	25.7	25.6	25.1
	4,605		20.5	25.8	33.4	24.3	
Twentymile							
Twelvemile	6,400			14.2			
N.F. Twelvemile	6,600			18.7			
Fifteenmile	6,000		23.9				22.3

D. Macroinvertebrates

Aquatic macroinvertebrates are an important component of aquatic ecosystems. Macroinvertebrates process vegetative material that enter streams and are an important food source for fish. Species of macroinvertebrates vary greatly depending on the water quality within the stream. Chemical and biological conditions and amount of sediment in the stream all influence macroinvertebrate ratings. Macroinvertebrates were used by the Fremont National Forest to monitor Burnt and Willow Creeks in 1989, 1990 and 1994. The Lakeview Resource Area, Lakeview District, BLM monitored Deep, Parsnip, Twelvemile and Camas Creeks in 1989 through 1994. Data from 1994 was not summarized at the laboratory. Table 30 gives the rating for aquatic health.

Table 30. Macroinvertebrate BCI Rating*

	1989	1990	1991	1992	1993	1994
Forest Service Sites						
Burnt Creek	69	66-67				57
(Elevation 5,920)	(Poor)	(Poor)				(Poor)
Willow Creek	98	81-86				60
(Elevation 6,000)	(Excellent)	(Good)				(Poor)
BLM Sites						
Deep Creek 1		76-75	75	70	66	
(Elevation 5,520)		(Fair)	(Fair)	(Poor)	(Poor)	
Deep Creek 2		79-77	74	73	67	
(Elevation 5,004)		(Fair)	(Fair)	(Fair)	(Poor)	
Parsnip Creek		70-62	62		62	
(Elevation 5,260)		(Poor)	(Poor)		(Poor)	
Twelvemile Creek 1		85-80	78	65	73	
(Elevation 5,040)		(Good)	(Fair)	(Poor)	(Fair)	
Twelvemile Creek 2	91-96	83-79	69	78	76	
(Elevation 4,635)	(Excellent)	(Good-Fair)	(Poor)	(Fair)	(Fair)	

	1989	1990	1991	1992	1993	1994
Camas Creek 1 (Elevation 5,440)		85-82 (Good)	79 (Fair)	75 (Fair)	82 (Good)	

*Aquatic macroinvertebrate samples along with physical habitat information and water quality test results were sent to the National Aquatic Ecosystem Monitoring Center in Provo, Utah and the USDI, BLM laboratory in Logan, Utah. A Biotic Condition Index (BCI) of each site was determined by the laboratory and is used in evaluation of the stream systems.

Macroinvertebrate samples generally show an overall decline in habitat conditions since monitoring was started in 1989. However, 1994 was a low flow year. The previous Dairy/Elder and South Creek Watershed Analysis showed that the low flow was approximately 40% of the normal low flows, as determined by long term averages. Flows in other years are a data gap.

The following narrative was excerpted from writeups provided by the USDA Forest Service laboratory in Provo, Utah for Forest Service sites.

1. Burnt Creek (1990)

The macroinvertebrate community was dominated by sediment tolerant taxa. Organic enrichment was also indicated in this stream reach. The potential for a fishery at this station appeared to be fair. This stream had a poor BCI for all periods of measurement which indicates extreme stress conditions were present in this stream reach. It appeared that there may be opportunities for management to improve water quality, instream habitat quality and possibly riparian habitat quality.

2. Willow Creek (1990)

There were indications of some sedimentation and organic enrichment at this station. The BCI of 81 indicated this stream was in good condition but could be better. Both periods prior to 1994 showed good to excellent BCI ratings. There appeared to be a fairly good potential for a fishery at this station. It appeared there may be some opportunity for management to improve the instream habitat quality and possibly water quality.

The BCI ratings for BLM sites were provided by the USDI BLM laboratory in Logan, Utah. The indicators of slight to moderate organic enrichment was found at all sites monitored. Sediment was not addressed by the BLM laboratory.

E. Municipal Water Supply

Two spring collection facilities are located in Upper Deep Creek subshed for municipal water for the Town of Lakeview. The location is NE1/4, Section 29, T. 39 S., R. 21 E., W.M. The contributing watershed for these collection boxes is less than 100 acres and has not been delineated on the ground. The condition of this area is unknown and ground review is needed to evaluate the condition of the spring source, watershed condition and management impacts.

Drinking water supplies are regulated through the Safe Drinking Water Act. Recent revisions to the Act put emphasis on "Source Area Management". Federal land management agencies have the responsibility to provide water which, with adequate treatment by the purveyor, will meet drinking water requirements.

F. Point Sources of Pollution

There are no known point sources of water pollution within the watershed.

G. Water Quality Summary

Most water quality stream temperature measurements were higher than State standards. Dismal, Twelvemile and Rosa Creeks were the only streams measured that met State water quality standards (Dismal Creek was marginal in 1994 and 1997). Sediment is generally within a range that is acceptable for fisheries with less than 15% of the measured sites exceeding the recommended 30% level for fines.

Species and Habitats

A. Terrestrial

1. Threatened, Endangered and Sensitive Species

a) Northern Bald Eagle (Threatened)

There are no known active or historic bald eagle nests or roost sites on BLM-administered or National Forest System lands. Isaacs and Silovsky (1981) characterized potential eagle nest and roosting areas for the Fremont National Forest and did not describe any portion of the Deep Creek watershed as potential habitat. Private lands around Adel do attract bald eagles in winter when climatic conditions (low ice years) and availability of carrion (deer, livestock and waterfowl) allow.

b) American Peregrine Falcon (Endangered)

The presence of potential habitat on Fish Creek Rim and historical observations was the driving force for peregrine releases at the Crump Lake hack site in the early 1990s. However, habitat potential is marginal because 1) the primary prey base of spring and fall migrants of neotropical birds, shorebirds and waterfowl is sporadic because of drought cycles (last witnessed in the late 1980s and early 1990s), 2) nesting substrate is limited by exposure (some of the best cliff faces are north or northeast facing - generally avoided by nesting raptors) and 3) proximity to prey base limits nesting use near the top of the rim. Four peregrine sightings were reported in the 1970s in the areas of Warner Canyon, Walker Canyon, Peddlers Creek and Mud Creek.

The Warner Basin is currently at a near historic high water level and waterfowl and shorebird numbers have greatly increased since the last drought cycle.

Boyce and White (1980) characterized peregrine nesting habitat on National Forest System lands. Of eight cliff sites assessed, none were rated as a priority for reintroduction (Table 31). None of these sites were identified as active, and none have been surveyed for peregrine occupancy since 1980. There are no sites designated as Management Area 2.

Habitat for prey species and hunting within the forested area of the watershed has improved with the removal of late seral forest and the corresponding increase in more open early seral forest cover types as a result of evenaged timber harvest. Most areas opened up in the 1980s, however, have since reforested. Disturbance sources have increased with a higher road density, more commercial logging activity and greater recreational use of the area since 1950.

Table 31. Peregrine Cliff Site Evaluation
(Boyce and White 1980)

Cliff Site	Potential
Willow Creek	Unsuitable
Willow Point/Crane Mt.	Low
S. Fork Cogswell Creek	Low
Kelly Creek	Medium
Drake Peak Lookout	Medium
Mud Creek	Medium
Drake Peak	High
Peddlers Creek	High

c) Western Sage Grouse

Western sage grouse surveys conducted in 1980 revealed leks ranging from five to 75 birds in size. Western sage grouse have been observed wintering in the area on windswept ridges and low sage flats and broods have been seen in the area throughout the summer. However, no crucial wintering or nesting habitat has been identified. Adult sage grouse require sagebrush year-round for food and cover and broods require forbs and insects for food.

Though no sage grouse habitat studies have been established in the watershed, during wet springs, forb production remains high and does not appear to be limiting grouse production. Current livestock management designed to comply with Section 7 consultation restrictions to benefit Warner sucker habitat and populations has shown some benefit to sage grouse and should continue to improve riparian areas, upland meadow forb production and increase residual nesting cover in the future. Sage grouse habitat condition can be inferred through interpretation of range studies and ecosite inventory data.

d) California Bighorn Sheep

California bighorn sheep numbers on Fish Creek Rim have increased steadily since the reintroduction of 15 animals in 1986. Habitat conditions appear adequate to support ODFW's goal of 100 animals. Bunchgrass communities on the face of the rim have benefited from small wildfires caused by lightning strikes.

2. Keystone Species

a) Big Game

Mule deer habitat conditions for the 25,000 acres of BLM-administered crucial winter range are generally satisfactory (Map 3). There are 3,000 to 4,000 acres of fairly young, vigorous antelope bitterbrush and 500 to 1,000 acres of curl-leaf mountain mahogany within the BLM crucial deer winter range portion of the watershed. There are some stands of decadent bitterbrush with very little recruitment of young plants because of heavy browsing pressure by deer and elk. However, the majority of bitterbrush range rates as satisfactory with adequate seedling replacement. The remaining winter range area is a mixture of low and big sage communities.

The expanding Warner Rocky Mountain elk herd which is currently at 150 animals with a management objective of 500 animals appears to be doing well. No serious competition for winter browse (bitterbrush and mountain mahogany) with deer or grass with livestock has been documented yet.

Pronghorn habitat is adequate to support the current number of animals utilizing the watershed. Maintenance of sagebrush habitats with a diversity of forbs through current livestock grazing management or prescribed burning is essential to lactating does and key to pronghorn productivity and survival. A large catastrophic wildfire or major aroga moth infestation could severely affect pronghorn or sage grouse habitat.

The current wildlife animal unit month allocation of 440 (equal to the entire allocation for the 500,000 acre Beaty Butte allotment) appears to be adequate to support the current number of deer, elk, pronghorn, sage grouse and other grazing wildlife species on BLM-administered lands. However, a future adjustment may be needed to accommodate the expanding elk herd. A catastrophic wildfire or major tent caterpillar infestation could negatively affect deer and elk habitat.

The forested portion of the watershed serves primarily as big game summer, transition and fawning/calving habitat. There are only 494 acres of designated deer winter range on National Forest System land (Map 3). Forested hiding cover ranges from a low of 0% in the Big Valley and Gibson Canyon subsheds (dominated by nonforest habitat) to a high of 65% in the Willow Creek subshed, with an overall average of 26% for the watershed (Table 32). A 40/60 cover-forage ratio is recommended as optimal (Thomas 1979).

From the 1950s through the 1980s logging activity created openings and increased edge habitat in the forest landscape, which improved overall forage conditions on summer range. Deer numbers during this period fluctuated greatly. Population indices calculated to five-year averages peaked in the early 1950s and reached the lowest levels in the early 1980s.

Logging activities in the 1950s began to decrease hiding cover and increase motorized access to summer ranges. In the later half of the century, high road densities and reductions in available cover reduced deer habitat suitability in many areas.

Road densities within subsheds on National Forest System lands vary from a low of 0.4 mi/mi^2 in the Upper Twelvemile subshed to a high of 5.1 mi/mi^2 in the Mud Creek subshed. Average road density for the watershed is 2.4 mi/mi^2 (Table 32).

Table 32. Hiding Cover and Road Densities on National Forest System Lands

Subshed	Total ac.	Hiding Cover ac.	% Cover	Road Miles	Road Density
Twentymile Creek	10	8	0.80	0.29	18.56
Willow Creek	2,881	5,587	0.64	111.88	5.11
Burnt Creek	2,265	5,059	0.60	69.66	5.08
Upper Deep Creek	8,446	4,895	0.58	57.84	4.40
Mud Creek	8,419	6,997	0.50	48.01	4.26

Subshed	Total ac.	Hiding Cover ac.	% Cover	Road Miles	Road Density
Lower Camas Creek	7,213	10,488	0.49	97.22	2.92
Fifteenmile Creek	8,774	1,380	0.48	23.3	2.70
Upper Twelvemile Cr.	6,407	1,028	0.45	29.26	2.63
Dismal Creek	5,530	2,650	0.41	11.43	2.54
Horse Creek	14,013	2,452	0.34	41.27	2.27
Cressler Creek	21,283	1,688	0.31	22.95	1.74
Crane Lake	11,618	3,025	0.26	19.59	1.67
Lower Deep Creek	7,087	573	0.08	24.08	1.57
Peddlers Creek	7,524	318	0.04	27.93	1.29
Drake Creek	9,838	1,332	0.03	75.39	1.25
Blue Creek	38,519	247	0.03	12.48	1.13
Gibson Canyon	13,851	55	0.00	4.1	0.54
Big Valley	4,824	1	0.00	1.4	0.40
Deep Creek Watershed Values:			0.26		2.41

* Hiding cover analysis does not include 1,544 acres on the Modoc National Forest or eastern portions of the Drake and Gibson Creek subsheds.

b) Beaver

Although no beaver population or habitat surveys have been conducted in the watershed, beaver habitat is gradually improving with the current livestock grazing management designed to benefit Warner suckers. Willows are reestablishing in areas previously occupied. Two other key foods, cottonwood and aspen, although still limited in number and distribution, are also showing some sign of limited recovery in small areas. The current wet cycle allows beavers to colonize areas previously unavailable during the drought of the early 1990s.

Potential habitat occurs in areas with riparian habitat and some level of deciduous vegetation. Current beaver numbers are probably lower than those occurring before the onset of trapping and intensive land use management.

c) Nongame Species

No nongame or neotropical bird surveys have been conducted in the watershed. Species dependent on sagebrush would require maintenance of a multi-aged sagebrush habitat component with a diverse grass and forb understory. Riparian area dependent species will benefit from current grazing management and future aspen/cottonwood management.

3. Management Indicator Species Associated with Late and Old (LOS) Forest Cover

a) General

There is no designated LOS forest cover on BLM-administered lands within the watershed. Dedicated old growth forest habitat (Management 14) occurs on 1,546 acres, or 2% of Forest Service acres (Map 13). Another 1,655 acres were classified as old-growth, but were not designated for management in the Forest Plan (Table 33). Large diameter live trees, snags and down wood are conspicuously absent from large areas of the landscape and greatly reduced in abundance and distribution in other areas. Overstocked understories in many stands are contributing to overstory mortality of large trees and an unraveling of late/old seral forest characteristics. The forest landscape is now fragmented by patches of early and mid-seral stands.

Table 33. Old Growth and LOS Acres

Subshed	MA 14 OG Acres	"Other" OG Acres	LOS Acres
Twentymile Creek	0	0	0
Mud Creek	0	0	3,712
Willow Creek	332	210	4,487
Burnt Creek	147	107	4,555
Horse Creek	0	0	3,101
Lower Camas Creek	221	21	4,587
Cressler Creek	0	36	684
Dismal Creek	303	265	1,596
Fifteenmile Creek	0	0	623
Crane Lake	0	0	1,491
Upper Deep Creek	542	1,026	4,109
Peddlers Creek	0	0	0
Blue Creek	0	0	22
Gibson Canyon	0	0	0
Drake Creek	0	0	171
Lower Deep Creek	0	0	189
Big Valley	0	0	684
Upper Twelvemile Cr.	0	0	73
Deep Creek Totals	1,545	1,665	30,084

Average and maximum patch sizes of late/old seral forest have been reduced. Average Interior LOS patch size is 22.5 acres and overall area of interior habitat is currently 30,084 acres (Table 34). Many patches which historically functioned as interior habitat now function as ecotone (edge) habitat and late/old forest cover is now strongly influenced by edge effects due to habitat fragmentation. At a finer spatial resolution, an average road density of 2.4 mi/mi^2 has added to the increase in edge and reduction of interior habitat. Road densities exceed 2.0 mi/mi^2 in 10 of the 18 subsheds (Table 32).

Table 34. LOS and Interior Habitat

Subshed	Acres Interior	% LOS Interior	Patch Numbers	Patch Acres	Patch Mean Acres	Patch Max
Twentymile Creek	0	0	0	0	0	0
Mud Creek	430	11.6	75	5.7	55.6	
Willow Creek	1,373	30.6	61	22.5	267.0	
Burnt Creek	1,601	35.1	46	34.8	590.4	
Horse Creek	1,072	34.6	46	23.3	149.4	
Lower Camas Creek	1,232	26.9	76	16.2	236.4	

Subshed	Acres Interior	% LOS Interior	Patch Numbers	Patch Mean Acres	Patch Max Acres
Cressler Creek	67	9.8	13	5.2	35.8
Dismal Creek	491	30.8	24	20.5	302.0
Fifteenmile Creek	46	7.4	11	4.2	25.4
Crane Lake	443	29.7	21	21.1	139.0
Upper Deep Creek	1,803	43.9	41	44.1	690.3
Peddlers Creek	0	0	0	0	0
Blue Creek	0	0	1	0.2	0.2
Gibson Canyon	0	0	0	0	0
Drake Creek	7	4.1	4	1.7	2.5
Lower Deep Creek	71	37.6	1	71.0	71.0
Big Valley	0	0	0	0	0
Upper Twelvemile Cr.	1	1.4	2	0.5	0.6
Watershed Values (not broken on subshed boundaries)	8,704	28.9	384	22.5	807.4

b) Goshawk

There is at least one known and one suspected active goshawk nest site within the watershed. Three historic nest sites (1980s and 1990s) have been recorded and occurred in the Cressler and Willow creek subsheds. Surveys for active territories have not occurred across the entire watershed, therefore active nest sites may exist that have not been discovered. Potential habitat exists in most LOS and mid-seral forest stands.

c) Pileated Woodpecker

There are no known active pileated woodpecker nest sites within the watershed. However, a few pileated sightings and foraging areas have been reported throughout the watershed in the early 1980s and early 1990s. No formal pileated woodpecker surveys have been conducted.

Potential habitat exists within 21,259 acres of mixed conifer LOS stands, but inadequate snag and down log abundance and small LOS patch size may preclude the ability to support breeding pairs of pileated woodpeckers over many of these acres.

d) American Marten

There have been no marten sightings recorded or surveys conducted within the watershed. Suitable marten habitat is represented in the 2,671 acres of LOS lodgepole pine and, to a lesser extent, in larger patches of mixed conifer (pine associated) LOS stands with heavy amounts of snags and down logs. Abundant down wood is a necessary habitat component. Since the down wood component was not evaluated, an accurate estimate of suitable marten habitat cannot be stated.

Decreased patch size and interior habitat have created less than optimal condition for marten in roaded portions of the watershed.

e) Black-backed/Three-toed Woodpecker

There have been no woodpecker surveys conducted within the watershed.

Like marten, black-backed and three-toed woodpeckers are associated primarily with areas of LOS lodgepole pine and somewhat with mixed conifer. These birds, however, require a constant supply of snags in the home range to make the habitat suitable. Large patches of snags, such as those created by a stand-replacement fire or insect outbreak, are often key habitat components in maintaining optimum densities of black-backed and three-toed woodpeckers. Since the snag component was not evaluated, an accurate estimate of black-backed/three-toed woodpecker habitat suitability is not possible.

4. Dead Wood Habitat Management Indicator Species

a) Primary Excavators

Survey information on snag density and distribution and primary excavator populations was not available to quantify current levels of population viability. However, trends in the vegetal character of the landscape lead to conclusions for several species. Excavators associated with open late/old ponderosa pine forest cover, such as white-headed and Lewis woodpeckers, undoubtedly have experienced a decline in habitat suitability/availability and bird distribution and numbers. Currently, potential habitat for these species exists within the 5,470 acres of LOS ponderosa pine. This decline is a result of forest succession from an open pine to a more dense mixed conifer dominated forest with a large component of late/old white fir in most stands above 6,000 feet elevation. Stand succession and fire suppression have also increased stand density to the detriment of these species, which prefer more open understory stand structure.

5. Aspen/Deciduous Riparian Habitat Management Indicator Species

a) Red-naped Sapsucker

There have been no sapsucker surveys conducted within the watershed.

Late and old aspen clones, the preferred habitat of both red-naped and red-breasted sapsuckers, has very limited distribution, with only about 4,000 acres of aspen occurring in the watershed. Many clones are generally in a decadent condition with little if any regeneration evident to replace the stands. Ungulate grazing in some areas continues to damage or destroy much of the limited regeneration that does occur. Many clones are mixed with conifer species that contribute to the decline of the stand. The distribution and total acres of aspen are undoubtedly less than what occurred 50 or 100 years ago.

B. Aquatic

Streams support populations of several species of game fish including redband trout (Oncoryhnchus mykiss), stocked hatchery rainbow trout (Oncoryhnchus mykiss) and brook trout (Salvelinus fontinalis). Nongame fish species include speckled dace (Rhynicthis ossculus) and Warner sucker (Catastomus warnerensis). Tables of fish distribution in the Deep Creek drainage are found in the Appendix (ODFW 1990). Generally, rainbow trout are found in lower Deep Creek between the confluence of Drake and Camas Creeks and redband trout are found in most of the streams surveyed. Brook trout were found only in Upper Mud Creek. Speckled dace were found in the lower reaches of Deep Creek and intermittently in Mud and Willow Creeks. The samples were taken with single pass electrofishing without blocknets and therefore represent a known minimum number of fish.

Redband trout are a Forest Service Pacific Northwest Region sensitive species. Inland redband trout are defined as an all inland, nonanadromous rainbow population occurring in central and eastern Oregon desert streams. According to Behnke (1992), several desiccated basins west of Alvord Basin and north of Lahontan Basin have the interior redband trout as their native trout species. The watershed is in the Warner Basin and is one of the interior redband trout basins.

Since 1990, the only hatchery fish released into the Warner Basin are in ponds and reservoirs. None are released into streams.

The genetic status of the trout currently found in the Deep Creek drainages is not known. Based on comparisons with specimens collected by Snyder in 1904, Behnke (1992) feels that the redbands in Warner are hybridized, more so now than for collections made in 1968.

The Warner sucker is found only below Deep Creek Falls. The reach of Deep Creek between the falls and Adel was surveyed in 1990 and 1994, no suckers were found (White et al. 1990, Allen et al. 1994). The original description of the Warner sucker was made from specimens collected from Deep Creek (at the time, Warner Creek) by J. O. Snyder (1908) and one sucker was captured in this reach of Deep Creek by a group doing food habitat availability for White Pelicans (Smith 1984).

A draft recovery plan for the native fishes of Warner Basin has been prepared (USFWS 1997). This plan covers both Warner sucker and Warner Valley redband trout. The criteria for recovery of the Warner sucker as they apply to Deep Creek include:

1. Self-sustaining metapopulation is adequately distributed throughout the basin including Deep Creek below the falls.

2. Adequate passage is restored within and among the drainages including Deep Creek below the falls so that the individual populations of Warner suckers can function as a metapopulation.

3. Determine stream flows required for Warner sucker recovery in the Warner Basin including Deep Creek.

4. Develop plans for securing stream and spring flows to assure adequate habitat for Warner suckers in the basin including Deep Creek.

1. Fish Habitat

Physical characteristic of pools per mile, deep pools, wetted width, large woody debris, bank stability and proper functioning condition ratings are summarized in Current Conditions-26.

Stream temperature and fines in the spawning substrate are summarized in Current Conditions-31.

2. Fish Barriers

The following locations have been identified as having conditions that make fish movement difficult or impossible.

Deep Creek. The falls are a major barrier to upstream movement of all species. There is a steep gradient culvert in Reach 5.

Drake Creek. There is an eight-foot falls below Oregon State Highway 140 that is a barrier to fish movement. At the confluence with the channel from Crump Reservoir, the debris dam left from the 1984 wash out is a barrier both up and down stream.

Mosquito Creek. A barrier falls occurs at the west side of Section 12, T. 41 S., R. 21 E., W.M.

Human Uses

Human use patterns during the current period within the boundaries of the Deep Creek watershed have followed along the lines of resource extractive activities. The resources were abundant and removed as needs increased within the parameters of the marketplace.

A. Timber

Before World War II, timber harvesting was limited and dependent on the lumber demands of the local and subregional market. The small communities and ranches in the area were growing and needed a good supply of cheap wood products. Infrastructure was limited predominantly to a single purpose in a specific direction. Roads were fairly easy to construct, but were only built for timber removal. Timber harvest became more frequent and widespread following the end of World War II (Table 35). The increased demand for raw materials for building and stable prices encouraged increased harvest activities within the forested environment. Almost all the roads and other infrastructure construction and improvements came about as part of the effort to remove the large ponderosa pine trees.

Table 35. Timber Harvest

Harvest Type	Harvest Definition	Acres	% of Harvest	% of Watershed
HCC	Clear Cut	2,730	29.5	1.52
HOR	Overstory Removal	4,110	44.3	2.28
HPR	Partial Removal	334.8	3.6	0.19
HSH	Shelterwood	176.9	1.9	0.10
HITM	Individual Tree Mark	107.8	1.1	0.01
HTH	Commercial Thinning	1,045.4	11.3	0.58
HXX	Unknown Type Cut	453.3	4.9	0.25
NULL	No Data	47.9	0.5	0.00
Barley	Barley TS	265.3	2.9	0.15
	(No Data Entered)			
	Total	9,271.4	100	5.08

Harvesting of the large pine increased throughout the current period. The harvest records of the Lakeview Ranger District and personal communication with long-term district employees indicate a steady increase of timber harvest levels through the 1970s and 1980s. The major

roads, which are paved today, were built during the 1960s and 1970s as well as a high percentage of the gravelled, log hauling roads (Table 32).

During the current period, several lumber mills in the Lakeview area built to receive timber off the forest opened, operated and closed. The majority of these mills fed a large market circle and at one time employed up to half of the area's employable workers. They were significant contributors to the local and regional economy.

About 1990, factors set in to drastically reduce the volume of logs coming out of the watershed. Factors included implementation of the Forest plan, the screens and concerns from the environmental community. Since the watershed does not have a large amount of dead and dying timber, the focus for volume removal is on thinnings and other removal strategies. Timber volume levels coming off the watershed now are about one-tenth of the harvest produced during the peak years.

B. Range

Livestock grazing on public lands contributes to the economic viability and stability of local communities in the Warner and Goose Lake Basins. It supports a lifestyle that many people feel is important to support and maintain.

Control of the grazing program was just coming into focus at the start of the current period. Conversion of sheep allotments to cattle took place at the beginning of the current period. The last sheep allotment was terminated in the 1960s. In the earlier part of the current period, the range allotments were changed from one large allotment to several smaller allotments. Cattle have dominated as the range animal for the largest part of the current period.

Presently, there are 20 grazing allotments within the watershed. Eleven grazing allotments occur within the BLM portion of the Deep Creek watershed, but only five (0200 Blue Creek, 0201 Vinyard Individual, 0202 Hickey Individual, 0206 Lane Plan II, and 0208 Sagehen) allotments are entirely within the watershed. All five allotments had a biological evaluation completed in 1994, and it was determined that livestock grazing on public land had no affect on the Warner sucker in the (0200) Blue Creek allotment and the determination in the other four allotments was "May affect, not likely to adversely affect".

There are portions of six other BLM grazing allotments within the watershed (Flynn 0501, Fitzgerald 0502, Lynch-Flynn 0520, Crump Individual 0204, Lane Plan I 0207, and Schadler 0209). These six also had biological evaluations in 1994 of grazing on public lands and the determination was "No Effect" on Warner sucker and their habitat.

Early in 1982, the BLM implemented a strategy for setting management priorities among grazing allotments. All allotments in the Lakeview District were categorized into one of three groups: improve (I), maintain (M) and custodial (C). I category allotments are those with unsatisfactory range resource conditions or conflicts with potential to improve and receive the first priority for investment. M category allotments are those where range conditions are generally satisfactory and the goal is to maintain those conditions. C category allotments are to be managed in a custodial manner to avoid deterioration of current resource conditions, may have a low percentage of public land, may have been designated for disposal, or may not have much potential for improvement. Of the 11 affected allotments, five are I category allotments, three are M and three are C.

Current livestock grazing allotments are described below and shown on Map 6.

Livestock Grazing Allotment Summaries (BLM)

The Blue Creek allotment (0200) has a small percentage of public land (600 acres) mostly in the Drake and Peddlers Creek subsheds. It is listed as a C category allotment. There are 131 AUMs of grazing preference authorized on the public land in the allotment.

The Vinyard Individual allotment (0201) is listed as an I category allotment. Deep Creek flows through the allotment, but except for a few watergaps, is now excluded from livestock grazing. The 510 AUMs of active preference are authorized on 8,600 acres of public land. The allotment is grazed spring and summer under a rest rotation grazing system.

There are 1.7 miles of Camas Creek and 0.5 miles of Drake Creek within the allotment. Both are excluded from grazing. There is also 8.5 miles of Deep Creek on BLM within the allotment and 8.1 miles are excluded from grazing except for four small watergaps spread out along the creek. There are 0.4 miles of Deep Creek on BLM and 0.75 miles of private land being grazed within the FRF pasture south of Rogers' ranch. This 0.4 mile portion of Deep Creek flows along the boundary between private and public land.

The Hickey Individual allotment (0202) is listed as an M category allotment. Camas and Parsnip creeks flow through the allotment and are grazed as riparian pastures with early use one year and rest from grazing the second. Five hundred eighty three AUMs of active preference are authorized on 11,318 acres of public land. The allotment is grazed spring, summer and fall under a rest rotation grazing system.

Parsnip Creek flows for 2.4 miles through the allotment with 1.4 miles excluded from grazing except for two small watergaps. There is one mile being grazed every other year for four to six weeks in the spring. There is also spring grazing (two to four weeks) every other year on the 1.9 miles of Camas Creek. There is a 0.5 mile reach of Drake Creek on public land that is excluded from grazing. There is an 0.8 mile reach of Parsnip Creek on private land that is grazed at various times during the year.

The Crump Individual allotment (0204) is listed as an I category allotment. About 11% of the 2,930 acres of public land in this allotment falls within the watershed. There are no perennial streams in this section of the allotment. There are 92 AUMs of active preference authorized on 2,930 acres of public land. The allotment is grazed spring and summer.

The Lane Plan II allotment (0206) is listed as an I category allotment. Parsnip and Drake Creeks flow through the allotment. Parsnip Creek is almost entirely on private land and the 2.75 miles of Drake Creek is almost entirely on public land. About 0.25 miles of Drake Creek is fenced off from livestock grazing and the lower 1.0 mile is virtually excluded by steep and rocky terrain. The 1.5 mile reach is grazed every other year in the spring. There is also a 0.75 mile Roaring Springs Fork of Drake Creek that is grazed the same as Drake Creek. The 450 AUMs of active preference are authorized on 9,910 acres of public land. The allotment is grazed spring and summer under a rest rotation grazing system.

The Lane Plan I allotment (0207) is listed as an M category allotment. About 25% of the 24,725 acres of public land in the allotment lie within the watershed. No perennial streams flow on the

portion of the allotment included in the watershed, though Squaw Creek, an intermittent stream, is a tributary of Deep Creek. The 1,942 AUMs of active preference are authorized on 24,725 acres of public land. The allotment is grazed spring, summer and fall under a rest rotation grazing system.

The Sagehen allotment (0208) is listed as an M category allotment. Deep Creek flows through the allotment with 1.2 miles on public land and 5.3 miles on private land. The private land owner recently agreed to cooperatively manage his land with the public land to meet riparian improvement objectives. The pasture is now grazed to meet utilization guidelines. A short watergap is provided for livestock on Camas Creek. The 266 AUMs of active preference are authorized on 3,820 acres of public land. The allotment is grazed under a deferred rotation grazing system.

The Schadler allotment (0209) is listed as a C category allotment. Sagehen and Crane Creeks flow through the allotment almost entirely on private land. About 70% of the 790 acres of public land in the allotment lie within the watershed. There are 57 AUMs of active preference authorized on 790 acres of public land. The allotment is grazed seasonally.

The Flynn allotment (0501) is listed as a C category allotment. Drake Creek flows through the allotment mostly on private land. About half of the allotment lies within the watershed and the other half is by Hart Lake. There are about 1,340 acres of public land within the watershed and about 60 AUMs of active preference are authorized on this public land. The allotment is grazed seasonally. Because of the large amounts of private land fenced in with the few acres of federal range the term "Fenced Federal Range" or FRF is used when describing the allotment. In addition, the grazing administration of these FRF allotments is minimal. Cattle use is authorized on an annual basis. The cattle using this area do not stay for any length of time on the BLM-administered land. The private land is divided into several pastures which contain the major water sources. The area serves as a gathering and holding pasture for the cattle moving from the BLM and private land to the Forest Service allotments.

The Fitzgerald allotment (0502) is listed as a C category FRF allotment. The allotment has three use areas, McDowell Creek pasture is the only one in the watershed. Cattle use is authorized on an annual basis. The actual grazing period that normally occurs in the McDowell Creek pasture is March 1 through November 15 annually. The cattle using this area do not stay for any length of time on the BLM-administered land. The area serves as a gathering and holding pasture for the cattle moving from the BLM and private land to the Forest Service allotments. Drake Creek flows through the allotment entirely on private land. About 3% of the 5,150 acres of public land in the allotment lie within the watershed. Three hundred twenty nine AUMs of active preference are authorized on 5,150 acres of public land. The allotment is grazed seasonally.

The Lynch-Flynn allotment (0520) is listed as an I category allotment. No perennial streams flow through the allotment. There are about 12,368 acres of public land in the allotment within the watershed. The allotment is grazed spring and summer under a rest rotation grazing system.

Livestock Grazing Allotment Summaries (National Forest)

The grazing management strategy on National Forest allotments has been classified under the Forest Range Environmental Study (FRES). FRES strategy A is Environmental Management Without Livestock. Livestock is excluded by various methods such as riding and fencing. FRES strategy B is Environmental Management With Livestock. Livestock use is within the apparent

present capacity of the range environment. Investments for range management are applied only to the extent required to maintain the environment at a stewardship level in the presence of grazing. FRES strategy C is Extensive Management of Environment and Livestock. Management systems and techniques are applied as needed to obtain relatively uniform livestock distribution and plant use and to maintain plant vigor. FRES strategy D is Intensive Management of Environment and Livestock. All available technology for range and livestock management is considered. Management seeks to maximize livestock forage production consistent with constraints of maintaining the environment and providing for multiple use.

Barley Camp allotment (A033) consists of 16,362 acres and is currently managed as a three pasture deferred rotation system under FRES strategy D for 783 cow/calf pairs under a permitted season of 7/1 to 9/30. The stock is rotated through the pastures starting at the lower elevation and then moving to the higher pastures as the season progresses. The sensitive areas of the two major drainages have been fenced into riparian pasture.

Crane/Kelly allotment (A036) is currently managed as a two pasture rest rotation system on the two pastures where the grazing activities impact the habitat of the Warner sucker. These two pastures consist of 8,595 acres. The total allotment consists of 20,830 acres and is permitted for 263 cow/calf pairs for a season of 6/25 to 10/14 on four pastures under FRES strategy C. On the pastures in Warner sucker habitat and within the Deep Creek watershed, 160 pair graze one pasture for approximately eight weeks, then are moved either to the pastures out of the habitat area or on to adjacent private land. This allotment has two areas fenced into riparian pastures for protection and controlled livestock use.

Crane Mountain allotment (A037) consists of 7,462 acres and is currently managed under FRES strategy B as a two pasture deferred rotation system for 150 cow/calf pairs under a term and 20 pair under a private land permit for a permitted season of 8/1 to 10/15. The deferred use on each pasture is scheduled for two years at a time.

Horse Prairie (A046) is a three pasture allotment. The Hickey Pasture contains 3,153 acres and is currently managed as an early season system by nine term and 49 private land permitted cow/calf pairs under a season from 7/16 to 8/30. This pasture has no sources of live water. Stock water is provided by depressions filled from snowmelt and rain. The other two pastures contain 8,455 acres plus 561 acres in two riparian pastures and are currently managed as a two pasture deferred rotation system for 326 cow/calf pairs permitted from 8/1 to 9/30. The entire allotment is managed under FRES strategy C.

Little Cove allotment (A049) contains 2,297 acres and is currently managed under FRES strategy B as a season long system for 150 cow/calf pairs under a permitted season 6/16 to 8/15. For the last couple of years though, the season has been 7/16 to 9/15. The cattle are split with one half going to the west area of the allotment and the other half going to the east area. The east area is where grazing impacts Warner sucker habitat. It has been determined this action may affect, but is likely to not adversely affect sucker habitat and therefore only 20% of the pastures will be monitored on an annual basis. In 1997 a pothole was blasted on the east side of Bull Prairie to collect surface water for livestock use to aid distribution. Also, a spring located farther west was developed and fenced for protection and the water piped to a trough.

McDowell allotment (A050) contains 5,299 acres and is currently managed under FRES strategy B as a season long system under a permitted season of 7/6 to 8/20 for 63 cow/calf pairs. For at least the last two years, planned use has been 32 cow/calf pairs from 6/30 to 9/11 and 45

yearlings 6/23 to 9/9. Reported actual use has been less than this in length of season and numbers.

Porcupine allotment (A052) contains 7,720 acres and is currently managed under FRES strategy C as a two pasture deferred rotation system under a permitted season of 7/1 to 9/30 for 200 cow/calf pairs. Only the east or the Porcupine unit is included in the consultation of grazing impacts on the Warner sucker. 1997 was the first year the allotment was grazed since 1991. The permit was acquired by a new operator.

Rogger Peak allotment (A053) contains 10,085 acres and is currently managed under FRES strategy C as a two pasture deferred rotation system under a term permitted season of 8/1 to 10/15 for 335 cow/calf pairs and a private land permit for 17 cow/calf pairs from 8/15 to 10/14.

Squaw Butte allotment (A055) contains 4,845 acres and is currently managed under FRES strategy B by two permittees under the provisions of on/off and private land permits. One on/off permit is for 53 cow/calf pairs from 7/16 to 9/30. The other such permit is for 24 cow/calf pairs from 7/16 to 11/30. The private land permit is for 32 cow/calf pairs from 7/16 to 9/30. Maintaining the on/off permits is contingent upon retaining control of the private lands which is owned by Fremont Sawmill.

C. Cultural Plants

Plants in the watershed have been used by Fort Bidwell Paiute and their ancestors. References are made by Isabel Kelley (1932) about the following plants. Locations have been verified by the BLM botanist. Tobacco root (Valeriana edulis) is found in Big Valley and wet meadows; camas (Camassia quamash) in Big Valley, Camas Valley and other creeks and meadows; epos (Perideridia gairdneri) and biscuit root (Lomatium canbyi) in lithic soils and scabland. Wild onions, bitterroot, sego lily, chokecherry, Indian plum and balsamroot were all collected and still grow within the watershed.

Resources of native food plants appear to be in good condition.

D. Administration

Forest Service guard stations were previously located within the watershed. These were removed during the 1970s, either destroyed by fire or dismantled. They were not replaced and Forest Service management is now accomplished out of the central district office.

E. Recreation

Camping occurs within rustic forest camps (Dismal, Deep and Willow Creeks, Twin Springs and Mud Creek). Dispersed camping is done in general forest areas. Hiking, horseback riding, mountain bike riding and off-highway vehicle riding takes place along the Fremont National Forest Recreation Trail (NRT) and the Crane Mountain National Recreation Trail, which are accessed at Walker, Rogger and Crane trailheads. Two semiprimitive motorized areas, Crane Mountain and Mt. Bidwell, offer additional off-highway vehicle recreational opportunity (Map 3). Forest Service roads 3615, 3915 and 3910 are the main snowmobile trails with some loop roads incorporated on an annual basis (depending on snow depth).

Aspen Cabin is available for rent from June through October and is also used as a winter warming cabin for snowmobilers and other winter recreationists.

On the lower reaches of the watershed, major recreation activities include but are not limited to stream and reservoir fishing, hunting, camping and ATV use. This use is low and dispersed and there are no designated or developed recreational sites or trails. Camping and ATV use increase during the fall hunting season. Roads in the area are rough and not maintained, but offer good four-wheel-drive access to the area. Most of the lower reaches are open to motorized vehicles, except the Fish Creek Wilderness Study Area (Map 3), where vehicles are restricted to existing ways and trails. Most recreational use occurs along Oregon State Highway 140 which parallels Deep Creek. Travellers commonly stop at Deep Creek Falls and at several other pulloffs to stretch and fish. One commercial permit to allow guided fly fishing trips on Camas, Deep and Drake Creeks is in the process of being issued. There are no other known commercial recreational activities in the watershed.

F. Archaeology

The area contains large numbers of archaeological sites. These include lithic scatters, occupation sites, stone tool material quarrys, vision quest sites and other religious sites. These sites are in some instances being impacted by livestock grazing at water locations. Some sites are being impacted by the activities of artifact collectors.

G. Wild and Scenic River

A preliminary eligibility determination report for Deep Creek was completed in 1996. The segment on the Fremont National Forest was found eligible for further study. The creek was found free flowing and fishery values outstandingly remarkable. The lower reach of Deep Creek on BLM-administered land was found not to meet the eligibility criteria established by Congress in the National Wild and Scenic River Act.